FARMERS' KNOWLEDGE ON POSTHARVEST PRACTICES OF VEGETABLES

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FARMERS' KNOWLEDGE ON POSTHARVEST PRACTICES OF VEGETABLES

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CERTIFICATE

This is to certify that the thesis entitled **"FAMERS' KNOWLEDGE ON POSTHARVEST PRACTICES OF VEGETABLES"** submitted to the Faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of **Master of Science** in **Agricultural Extension and Information System**, embodies the result of a piece of *bona fide* research work carried out by **Md. Javed Azad**, Registration No. 06-01861under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

I further certify that any help or source of information, received during the course of this investigation has been duly acknowledged.

Dated:

Dhaka, Bangladesh

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DEDICATED
TO
MY BELOVED
PARENTS

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The Author

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ACRONYMS AND ABBREVIATIONS

BAU Bangladesh Agricultural University

BBS Bangladesh Bureau of Statistics

BARI Bangladesh Agricultural Research Institute

DAE Department of Agricultural Extension

et al. All others

etc. et cetera, and the other

FAO Food and Agriculture Organization

SO Scientific Officer

SPSS Statistical Package for Social Science

SAAO Sub-Assistant Agriculture Officer

SAU Sher-E-Bangla Agricultural University

FARMERS' KNOWLEDGE ON POSTHARVEST PRACTICES OF VEGETABLES

ABSTRACT

The purpose of this study was to determine the farmers' knowledge on post harvest practices of vegetables and explore the contribution of the selected characteristics of the vegetable growers on their knowledge on postharvest practices of vegetables. The selected characteristics were age, level of education, family size, farm size, vegetable cultivation area, experience in vegetable cultivation, annual family income, annual income from vegetable cultivation, commercialization of vegetables, training exposure on vegetable cultivation, adoption of postharvest practices and problem faced in vegetable cultivation. Data were gathered from 109 vegetable growers of six villages of Belgachi Union of Alamdanga Upazila under Chuadanga district by using a pretested interview schedule. For harmonious representation from each village 30 percent vegetable growers were selected as the sample by using stratified random sampling method. Stepwise multiple regression was used to examine the contribution of the selected characteristics of the vegetable growers on postharvest practices of vegetables. The findings revealed that majority of the respondents (56 percent) had medium knowledge on post harvest practices of vegetables, while 8.3 percent had low knowledge and 35.8 percent had high knowledge. Hence, more than half (64.30 percent) of vegetable growers had low to medium knowledge on postharvest practices of selected vegetables. Stepwise multiple regression exposed that adoption of postharvest practices, problem faced in vegetable cultivation, experience in vegetable cultivation, training exposure on vegetable cultivation, level of education had significant contribution on their knowledge on post harvest practices of vegetables. The standardized partial 'b' co-efficient of the 5 independent variables formed the equation contributing to 19.70 percent of the total variation on knowledge on postharvest practices of vegetables. Farmers faced higher problems in 'lower price of vegetables' followed by 'high price of inputs' and 'disease attack'.

INTRODUCTION

1.1 Background of the Study

Vegetables are the most important component of our food and are rich in vitamins, minerals and fibers essential for human health. A number of vegetables are considered as protective food items which prevent many disease and ailments like, dislipidemea, cardiac disease, diabetes and constipation. Vegetables can be grown round the year utilizing homestead lands which yield high economic return and help in emploment and income generation.

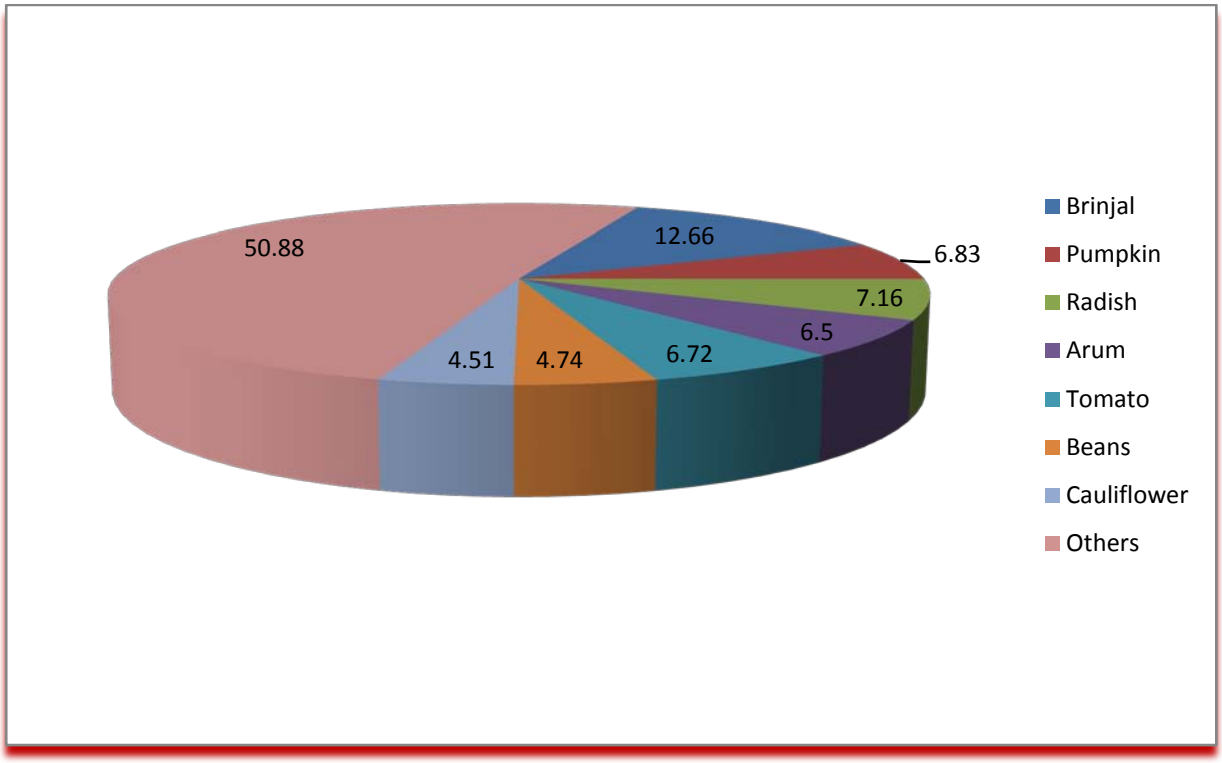
However, the present consumption vegetables in Bangladesh is 126 gm/day/capita (23 g leafy vegetables, 89 g non-leafy vegetables and 14 g fruit), which is far below the minimum average requirement of 400 g/day/capita (FAO/WHO 2003). However, according to HIES (2005), the present consumption of fruits and vegetables including potato were 253 g/day/capita, which indicates a poor dietary status in Bangladesh.

Although root and tuber crops, namely, potato, sweet potato, aroids and yams are considered as vegetables in bangladesh. Depending on growing season in Bangladesh vegetables are classified as winter and summer vegetables. Among the winter vegetables, brinjal, pumpkin, cabbage, cauliflower, tomato, bottle gourd, radish, country bean and indian spinach are important; and among summer vegetables, pumpkin, brinjal, pointed gourd, lady's finger, ribbed gourd, snake gourd, bittergoud, yard long bean, cucumber, ash gourd, amaranths and Indian spinach are important.

The contribution of vegetables remains extremely important for ensuring food and nutritional security in Bangladesh. Horticultural crops in Bangladesh cover an area of 873 thousand hectares with a total production of 110 lakh metric tons (BBS, 2009). The major vegetable growing areas of Bangladesh are Jessore, Bogra,

Comilla, Chittagong, Khulna, Kushtia, Dhaka, Tangail, Rangpur, Rajshahi and Dinajpur and a major part of the vegetables produced in this area are transported to the capital or other cities as soon as possible through different marketing channels (Ahmed, 1992; Hossain, 2000).

Figure 1.1 and Table 1.1 are showing the area under vegetable (winter & summer) in Bangladesh, 2010-2011 and vegetable productions in Bangladesh, 2010-2011 respectively.



Source: BBS, Statistical Year Book, 2011

Fig.1.1 Area Under Vegetable (Winter & Summer) in Bangladesh, 2010-2011

Table 1.1 Vegetable productions in Bangladesh, 2010-2011

Item	Year (2010-2011) Thousand M. Tons
Brinjal	340
Cucumber	48
Cabbage	207
Tomato	232
Pumpkin	217
Pointed gourd	83
Potato	8226
Lady's finger	43
Ridge gourd	46
Bitter gourd	45
Snake gourd	31
Arum	237
Radish	257
Beans	95
Cauliflower	168
Water gourd	137

Source: BBS, Statistical Year Book, 2011

The desired level of development of vegetables has not yet been achieved because of a number of constraints. Due to absence of an appropriate postharvest management system, a bulk quantity of the harvested vegetable is damaged every year. Post harvest activities include cooling, curing, sorting, grading, handling, storage, processing, wrapping, packaging, transporting and marketing. Post harvest management is about maintaining quality from production in the paddock to the vegetables being placed on a plate for consumption. Maintaining vegetable quality requires good systems. More importantly, the lack of proper storage and marketing facilities, and seasonal glut force the farmers to sell their hard-earned produce at throw-away prices. The food and nutrition situation in Bangladesh is fragile due to inadequate and imbalanced diet intake. Consumption of a diversified diet to meet the needs of macro and micro nutrients needs to be promoted (Bhattacherjee *et al*. 2007; NFP 2008; BDHS 2009).

Maintaining vegetable quality requires better postharvest practices and good communication throughout the supply chain as each step is influenced by the previous; it is a chain of interdependent activities.

Farmers produce vegetable crop, which are particularly perishable in nature; it should be brought to the consumer as quickly as possible in order to justify the market requirement. Unfortunately, often poor prepackaging and poor handling methods and marketing systems cause a high post-harvest loss of the commodity. Its quality deteriorates gradually during temporary storage, prepackaging, transport, wholesaling and retailing, particularly when the conditions remain unfavorable and at a stage it becomes unfit for marketing or human consumption. It is estimated that a loss of nearly 25-40% of the vegetables occurs due to rough prepackaging and improper post harvest handling, transportation and storage practices and the variation often depends on type of vegetables (Singh and Chadha, 1990).

There are different causes of the post harvest losses, which vary from commodity to commodity. The table reveals that vegetables and fruits suffer from the highest proportions of losses. The Table 1.2 shows the principal causes of post harvest losses and poor quality of vegetables and fruits.

Table 1.2 Causes of post-harvest losses of vegetables

Group	Varieties	Principle causes of post-harvest losses and poor quality
Root vegetables	Carrots Beets Garlic Sweet potato	Mechanical injury Improper carling Sprouting and rooting Water loss (Shriveling) Decay
Leafy vegetable	Lettuce Spinach Cabbage	Water loss (Witting) Loss of green colour Mechanical injuries Decay
Flower vegetables	Broccoli Cauliflower Abscission Decay	Mechanical injuries Discoloration
Immature fruits, egg plant, okra	Cucumber Squash	Over maturity at harvest Water loss Bruising and injuries Chilling injury Decay
Mature and all fruits	Tomato Malons Citrus Banana Mangoes Apples	Bruising Over ripeness Water loss Compositional changes Decay

Source: Quddus and Mia, 2010

Ali, *et al.* (2013) revealed that postharvest losses from growers to consumers of Toamto, Brinjal, Cabbage and Cucumber were 31.09%, 32.03%, 24.94% and 24.28% respectively. The percentage of causes of postharvest losses of these vegetables is shown in Table 1.4. Postharvest losses of different vegetable may be shown in Picture 4.2- 4.8.

Table 1.3 Causes of post-harvest losses of selected vegetables

Crops	Levels of Supply Chain	% Losses					
		Insect	Diseases	Immature/ Over mature	Packaging & Transportation	Shrinking & Others	Total
Tomato	Grower	1.17	1.38	0.96	0.91	0.75	5.17
	Collector	1.18	1.22	1.12	1.46	1.14	6.12
	Wholesaler	1.68	1.75	1.24	0	1.88	6.55
	Retailer	1.22	1.42	1.24	0.98	0.93	5.79
	Consumer	1.81	2.12	1.86	0	1.67	7.46
	Total	**7.06**	**7.89**	**6.42**	**3.35**	**6.37**	**31.09**
Brinjal	Grower	1.85	1.75	0.84	1.08	0.82	6.34
	Collector	1.22	1.06	0.76	1.18	1.04	5.26
	Wholesaler	1.14	1.04	1.02	0	1.82	5.02
	Retailer	1.19	1.16	1.08	1.04	1.06	5.53
	Consumer	3.25	3.13	0.75	0	2.75	9.88
	Total	**8.65**	**8.14**	**4.45**	**3.30**	**7.49**	**32.03**
Cabbage	Grower	2.13	1.67	0.64	0.95	0.75	6.14
	Collector	1.25	1.13	0.67	1.18	0.81	5.04
	Wholesaler	0.94	0.92	0.82	0	1.78	4.46
	Retailer	1.25	1.13	0.67	0.98	1.13	5.16
	Consumer	1.25	1.13	0.25	0	1.51	4.14
	Total	**6.82**	**5.98**	**3.05**	**3.11**	**5.98**	**24.94**
Cucumber	Grower	1.37	1.13	0.52	0.50	0.50	4.02
	Collector	1.25	1.13	0.67	1.16	0.81	5.02
	Wholesaler	0.96	0.87	0.67	0	1.67	4.17
	Retailer	1.25	1.13	0.67	2.25	2.12	7.42
	Consumer	1.13	1.00	0.25	0	1.27	3.65
	Total	**5.96**	**5.26**	**2.78**	**3.91**	**6.37**	**24.28**

Source: Ali, *et al.* 2013

The Table 1.4 presents a picture depicting enormous losses of agricultural commodities and its implications in terms of loss of the quantities of annual losses of individual food commodities in our country. Postharvest losses of different vegetable may be shown in Picture 1.2-1.9

Table 1.4 Extent of post harvest losses of different food produces in Bangladesh

Sl. No.	Food commodity	Percent of postharvest Loss (%)	Quantity of postharvest loss proportionate to the annual production 2005-2006 (Million MT)
1.	Cereal grains (rice and wheat)	13.6	3.71
2.	Fruits	15.0	0.44
3.	Vegetables	26.0	1.25
4.	Potatoes	21.0	0.87
5.	Pulses	14.6	0.04
6.	Oil seeds	12.3	0.03

Source: WFP, FPMU of MOFDM/FAO

Source: Ali *et al. 2013*

Fig. 1.2 Brinjal on the truck without any packaging

Source: Ali *et al.* 2013

Fig. 1.3 Damaged brinjal after traditional practices

Source: Ali *et al.* 2013

Fig. 1.4 Cabbage transport without packaging

Source: Ali *et al.* 2013

Fig. 1.5 Damaged cabbages after traditional practices

Source: Ali *et al.* 2013

Fig. 1.6 Over loaded mixed transport of cucumber

Source: Ali *et al.* 2013

Fig. 1.7 Damaged cucumbers after traditional practices

Source: Ali *et al.* 2013

Fig. 1.8 Non sorted non graded tomato

Source: Ali *et al.* 2013

Fig. 1.9 Damaged tomatoes after traditional practices

1.2 Justification of the Study

Postharvest management is pivotal in an agricultural country such as Bangladesh. Success in agricultural production and in marketing hinges upon proper postharvest handling, storage, and processing of cereals, oil seeds, legumes and horticultural crops. Current postharvest handling of these crops, however, presents a dismal picture. Traditional techniques which result in considerable deterioration of physical and nutritional quality are generally practiced by growers, traders and processors. Improvement of these age-old practices and development of new practices through organized research and development efforts have now become essential in order to reduce the tremendous levels of postharvest losses in grains, fruits and vegetables, so as to increase the supply for food from a limited land resource area and thereby strengthen the economy of the country.

The post-harvest practices of fruits and vegetables scenario are quiet unsatisfactory and mostly comprise of traditional techniques practiced by the growers, traders and processors, owing to which considerable deterioration in physical and nutritional qualities of the harvested in Bangladesh. It is estimated that the post-harvest loss of fruits and vegetables in the country is about 25-35% (Mia and *et al*, 2008). Therefore, improvement of these indigenous practices and development of low cost new technologies through precise research efforts has now become essential to prevent the huge post-harvest losses of vegetables in view of ever increasing, demand for food and nutrition. In the development plans, considered post-production phenomenon merely as a support programme and the allocated resources for this sub sector was only negligible amount of the total investment in agriculture sector. Under such situation, reduction of post-harvest losses has become the prime issue to increase the availability of vegetables at household level. However, the existing status of post-harvest handles including sorting, grading, wrapping, packaging, transportation, storage, processing and preservation of our harvested vegetables and to identify the loss reduction interventions. The experience in developed countries shows that the post-harvest losses of vegetables produce could

be reduced by using technology together with appropriate selection, sorting, grading, wrapping, packaging, preservation, transportation, , processing and marketing. However, the country like Bangladesh suffer much of the post harvest losses due to a number of factors such as lack of adequate knowledge and information, the unavailability of appropriate practices under funded research and development. However, many countries in this region possess their own indigenous, inherited knowledge in the field of post-harvest practices which perhaps has been neglected in the hurry to modernize. It is high time that researcher and policy makers come together discuss the issue of post-harvest practices and develop knowledge to facilitate the exchange of available practices and information between them. Considering the above facts the researcher became interested to carry out the present study on "**Farmers' Knowledge on Postharvest Practices of Vegetables."**

1.3 Statement of the Problem

There are number of proven recommended technologies but not all of those are accepted by the farmers although they are intelligent and hard working. As a result a wide gap between actual achievement and achievable potential in the vegetable farming system still exists. Attainment of highest possible yields in vegetable and thereby maximum profit may be achieved only when farmers are well equipped with required technological knowledge and needed inputs and other relevant supports and most authentically if knowledge and skills are applied correctly in the field. Hence, a systematic research is needed to correctly estimate the levels of postharvest losses, both quantitative and qualitative (nutritional), of the commercially important fruits and vegetables in Bangladesh. Identification of technological and knowledge gaps existing in the entire value chain of vegetables is also a critical research question. On the basis of the above discussion, the researcher undertook an investigation entitled **"Farmers' Knowledge on Post Harvest Practices of Vegetables."** The main purpose of the study was to determine knowledge of the farmers in post harvest practices of selected vegetables and to ascertain the contribution of the selected characteristics of the

farmers to their knowledge on post harvest practices of vegetables. However, the study attempts to find out the answers to the following questions:

1. To what extent the farmers have knowledge on post harvest practices of vegetables?
2. What are the selected characteristics of the vegetable growers?
3. To what extent relationships exist between the selected characteristics of the farmers and their knowledge?
4. To what extent the selected characteristics of the farmers contribute to their knowledge on postharvest practices of vegetables?
5. What are the problems faced by the farmers in vegetable production?

1.4 Specific Objectives

i) To assess the extent of following selected characteristics of the vegetable growers:

a) Age
b) Level of education
c) Family size
d) Farm size
e) Vegetable cultivation area
f) Experience in vegetable cultivation
g) Annual family income
h) Annual income from vegetable cultivation
i) Commercialization of vegetables
j) Training exposure on vegetable cultivation
k) Adoption of post harvest practices of vegetables
l) Problem faced in vegetable cultivation

ii) To assess farmers' knowledge on post-harvest practices of vegetables

iii) To explore the contribution of the selected characteristics of the growers to their knowledge on postharvest practices of vegetables

iv) To compare the severity of the problems faced by the vegetable growers

1.5 Limitations and Scope of the Study

The study was undertaken in order to have an understanding of the knowledge of the farmers in postharvest practices of vegetables. With a view to conducting the research in a meaningful and manageable way, it becomes necessary to impose some limitations with regard to certain dimensions of the study. Considering the limitations of time, money and other resources available to the researcher, the following limitations were observed throughout the study:

1. The study was confined to Alamdanga upazilla in Chuadanga district.
2. Population for the present study was kept confined within the heads of farm families in the study area.
3. There were many characteristics of the farmers in the study area but only 12 of them were selected for investigation.
4. For information about the study, the researcher depended on the data furnished by the selected respondents during their interview with him.
5. Facts and figures collected by the researcher applied to the situation prevailing during the year 2012.
6. Reluctance of the farmers to provide information was overcome by establishing rapport.

1.6 Assumption of the Study

An assumption is the supposition that an apparent or principle is true in the light of the available evidence (Goode and Hatt, 1952). The researcher had the following assumptions in mind while undertaking this study:

1. The respondents included in the sample were capable of furnishing proper responses to the questions included in the interview schedule.
2. The responses furnished by the respondents were reliable. They express the truth while passing their opinions and providing information.

3. The views and opinions furnished by the vegetable growers included in the sample were the representative views and opinions of all the vegetable growers of the study.
4. The researcher who acted as interviewer was well adjusted to the social and cultural environment of the study area. Hence, the respondents furnished their correct opinions without hesitation.
5. Data were normally and independently distributed with their means and standard deviation.
6. The findings of the study will have general applications to other parts of the country with similar personal, socio-economic and cultural conditions.

1.7 Definition of Terms

A researcher needs to know the meaning and contents of every term that he uses. A concept is an abstract of observed thing; events or phenomenon. It should clarify the issue as well as explain the fact to the investigator and readers. However, for clarity of understanding, a number of key concepts/terms frequently used throughout the study are defined and interpreted as follows:

Respondents: Randomly selected people considered to be representable of the population are known as respondents. They are the people from whom a social research worker usually gets most data required for his research. In this study the respondents were the village level vegetable farmers.

Farmers: The persons who were involved in farming activities are called farmers. They participated in different farm and community level activities like crops, livestock, fisheries, other farming activities etc. In this study, vegetable growers were treated as farmers.

Age: Age of a respondent was defined as the span of life and was operationally measured by the number of years from his/her birth to the time of interviewing.

Level of education: Empirically it was defined to the development of desirable changes in knowledge, skill and attitudes in an individual through reading, writing, walking, observation and other selected activities. It was measured on the basis of classes a farmer has passed from a formal educational institution.

Family size: Family size referred to the number including the respondent himself, his wife, children and other permanent dependents, who lived and lived together in a family unit.

Farm size: Farm size meant the total area of land on which a farmer's family carried on farming operations in terms of full benefit to the family.

Vegetable cultivation area: Vegetable cultivation area referred to the area of land under his/her management only for vegetable cultivation. The area was estimated in terms of full benefit to farmers or his/her family.

Experience in vegetable cultivation: Experience as a general concept comprises knowledge or skill of something or some event gained through involvement in or exposure to that thing or event. Experience refers to the nature of the events someone or something has undergone. Experience is what is happening to us all the time - as long we *exist*. However, in this study, it was considered as the year of starting from first vegetables cultivation till the year of data collection.

Annual family income: Annual family income referred to the total earnings of a respondent and the members of his family from agricultural and non-agricultural sources (business, services, daily labour etc.) during the previous year.

Annual income from vegetable: Annual family income of a respondent generally refers to the total earning by him and other members of his family from different sources during a year. Annual income from jackfruit of the respondent only includes the earning from vegetable by the respondent. It was expressed in thousand Taka.

Commercialization of vegetable: Commercialization of vegetable referred to the ratio of value of vegetable sold and total value of vegetable raised. It was expressed in percentage.

Training exposure on vegetable cultivation: Training exposure of a respondent was referred by the number of days a respondent trained on vegetable cultivation. The measurement included from the day of starting training on vegetable cultivation and till the day of data collection.

Adoption: Adoption is a decision to use an innovation by an individual and continue to use the innovation (Rogers, 1995). In the present study, adoption of selected post harvest practices of vegetables by the farmers was taken into consideration.

Problem faced: Problem means any difficult situation which requires some actions to minimize the gap between "what ought to be" and "what is". The term problem faced referred to different problem faced by the farmers in vegetable production, harvesting and marketing.

Knowledge: Knowledge is operationally defined for the purpose of this investigation as 'those behaviors and test situations, which emphasized the remembering either by recognition or recall of ideas, material or phenomenon'. It referred to the amount of understood information possessed by the farmers on various aspects of post harvest practices of vegetables.

Post Harvest practice: Post harvest practices include cooling, curing, sorting, grading, handling, storage, processing, wrapping, packaging, transport and the market phase. Post harvest management was concerned with maintaining quality from production in the paddock to the vegetables being placed on a plate for consumption.

CHAPTER 2
REVIEW OF LITERATURE

This chapter deals with the review of past research works that relates to this investigation directly or indirectly. The reviews are conveniently presented based on the major objectives of the study. The aim of this study was to have an understanding of farmers' knowledge on postharvest practices of vegetables and the contribution of the selected characteristics of the farmers to their knowledge on postharvest practices. Despite frantic search, the researcher found only a few literatures related to this study. The researcher came across with some expert opinions and has tried his best to collect needful information through searching relevant studies, journals, periodicals, bulletins, leaflets, internet etc. These enhanced the researcher's knowledge for better and clear understanding of the present study. But unfortunately no previous literature was found related to relationship between farmers' knowledge on post harvest practices of vegetables and their characteristics. On this consideration, this chapter has been presented in four sections as follows:

Section 1: Concept of Knowledge

Section 2: General Findings on Post Harvest Losses of Vegetables or any other Crops

Section 3: The Relationship between Farmers' Characteristics and Their Knowledge

Section 4: The Development of Conceptual Framework of the Study

2.1 Concept of Knowledge

Knowledge can be defined as the 'understanding obtained through the process of experience or appropriate study'. Knowledge can also be an accumulation of facts, procedural rules, or heuristics. Here-

- A fact is generally a statement representing truth about a subject matter or domain.
- A procedural rule is a rule that describes a sequence of actions
- A heuristic is a rule of thumb based on years of experience

Knowledge is the result of some activity such as generation, storage, dissemination and utilization of something that entails either information or data. It is usually based on learning, thinking, and proper understanding of the problem area. It is not information and information is not data. Knowledge is derived from information in the same way information is derived from data when processed or patterned in human mind. It can be considered as the integration of human mind. It can be considered as the integration of human perceptive processes that helps them to draw meaningful conclusions.

So when a pattern relation exists among the data and information, the pattern has the potential to represent knowledge. It only becomes knowledge, however, when one is able to realize and understand the patterns and their implications.

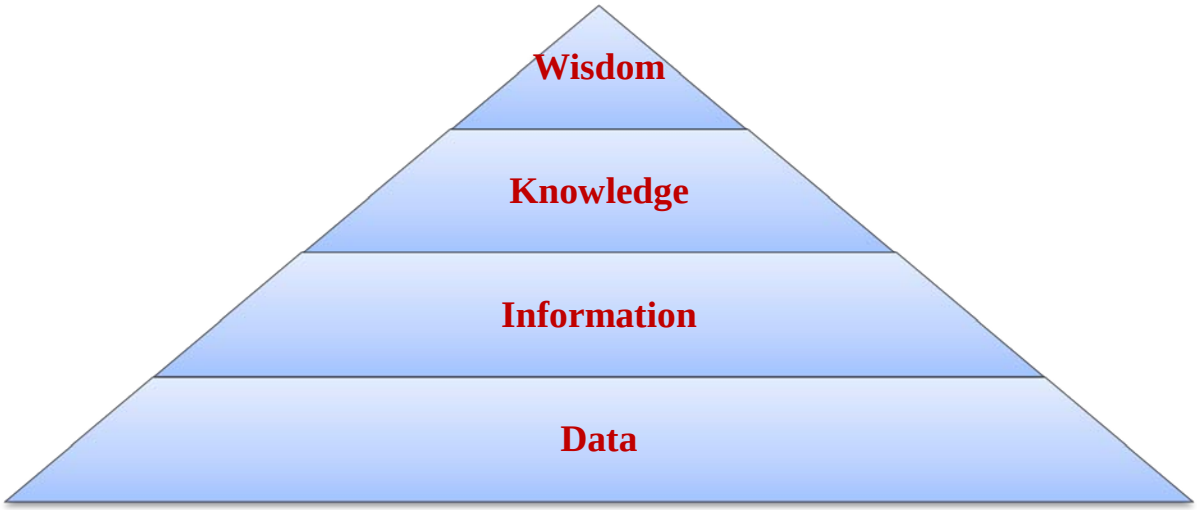


Figure 2.1 Data, information, knowledge and wisdom process

2.2 General Findings on Postharvest Losses of Vegetables or any Other Crops

Hassan *et al.* (2011) observed that post-harvest wastage of 13 selected fruits and vegetables in major growing areas annually costs the country about Tk. 3,442 crore on retail price. Findings also showed that the post-harvest loss ranges from 23.6 to 43.5 percent of the fruits and vegetables that include jackfruit, pineapple, papaya, mango, litchi, banana, orange, cucumber, cauliflower, tomato, okra, brinjal, and red amaranth. Among the selected fruits, post-harvest losses have been found maximum 44 percent in jackfruit with main diseases syndromes of shoot and fruit borer, stem-bleeding, and died-back that appeared as the serious threat in the leading jackfruit producing areas such as Mymensingh and Gazipur. The loss is attributed to the fact that jackfruit is seriously damaged by fruit borer (insects) and is soft rot since the growers of the surveyed region, Mymensingh and Gazipur, hardly apply any pesticides or fungicides to reduce damages in the field. The second important reason for higher loss in jackfruit is the excessive use of ripening chemicals, which accelerate fruit ripening and dramatically shorten shelf life.

Medagoda (2011) observed in a study that a very low percentage of total produce is consumed as a food amounting 30 percent and greater percentages, amounting to about 70 percent is lost in the form of pre and post-harvest losses. The major constraint reported in marketing were the absence of properly organized marketing structures, lack of processing plants and the poor demand in local market for jack products. An integrated approach would improve productivity, quality and income from jack cultivation contributing to poverty alleviation in the rural sector to a considerable extent.

Patil (2008) found that ‘Higher the value addition better the post-harvwst management and lower will be losses’. He also mentioned some reasons for losses such as handling of raw produce through many stages of middlemen, processing is mostly controlled by urban rather than rural entrepreneurs which leads to losses in valuable by products, non availability of adequate and efficient equipment and machinery to be used in catchment areas, low level of entrepreneurial urge in rural

areas due to constraints of finance, assured market and proper training on technology and on the whole, there exists a fragmented and inefficient value chain.

Wills *et al.* (2004) reported that a considerable proportion of the harvested produce never reaches the consumers mainly because of postharvest losses. The estimated postharvest losses of fruits and vegetables lie in the range of 20-40%.

Amiruzzaman (1990) found that the magnitude of post-harvest losses of major fruits and vegetables in Bangladesh is 25-50 percent and it is only 5-25 percent in developed countries as reported by Khader, 1992.

Pantastico (1977) opined that the amount of post-harvest loss of fruits and vegetables each year in the Philippines has been estimated at 29 metric tons of protein which could supply the protein requirement of 1.3 M Filipinos.

Hussain, (1993) found that Post-harvest losses in durable crops ranged between 10-15 percent; loss in semi-perishable crops was 15-30 percent and that of perishables, 25-40 percent. During the peak season for example, about 50 percent fruits mainly pineapple, watermelon, jackfruit, tomato etc. is lost due to inadequate processing facilities in Bangladesh.

FAO (1989) reported that estimates of the post-harvest losses of food grains in the developing world from mishandling, spoilage and pest infestation are put at 25 percent; this means that one-quarter of what is produced never reaches the consumer for whom it was grown, and the effort and money required to produce it are lost-forever. Fruit, vegetables and root crops are much less hardy and are mostly quickly perishable, and if care is not taken in their harvesting, handling and transport, they will soon decay and become unfit for human consumption. Estimates of production losses in developing countries are hard to judge, but some authorities put losses of sweet potatoes, plantain, tomatoes, bananas and citrus fruit sometimes as high as 50 percent, or half of what is grown. Reduction in this wastage, particularly if it can economically be avoided, would be of great significance to growers and consumers alike.

Chaudhry (1998) observed that the sum-total of losses in food grains amount to 1.44 million tons valued at Rs.3.13 billion which if converted into dollar currency units will equal to 316.15 million, US Dollars. From any international standard, it is an immense recurring loss which the developing economy of Pakistan can hardly afford to bear.

Oyeniran (1988) revealed that although postharvest loss estimate figure for fruits and vegetables are difficult to substantiate especially in developing countries like Nigeria, it is however estimated that losses as high as 50 – 70 percent are common in the tropics between the production areas and consumption points.

Kader (1992) showed that the magnitude of post-harvest losses of fresh fruits and vegetables is estimated to be 5 to 25 percent in developed countries and 20 to 50 percent in developing countries depending upon commodity.

Singh and Chadha (1990) reported that a loss of nearly 25-40% of the vegetables occurs due to rough prepackaging and improper post harvest handling, transportation and storage practices and the variation often depends on type of vegetables.

Sharma (1987) reported that, post harvest losses of vegetables in Bangladesh as high as 43%. The average post harvest loss estimated by khan (1991) is 26%.

Muntad (2009) reported both quantitative and qualitative losses of extremely variable magnitudes occurring at all stages in the post-harvest system from harvesting, through handling, storage, processing and marketing to final delivery to the consumer, processing and marketing to final delivery to the consumer.

Karim and Hawlader (2005); Aujla *et al. (*2011) reported that postharvest loss of fruits and vegetables is estimated to be 30-40% in developing countries, Tanzania inclusive.

Zheng *et al*. (1999) ovserved that the main factors responsible for postharvest losses were lack of proper packaging, no precooling, no proper transportation, and

lack of good storage techniques. It was estimated that the postharvest losses of Chinese cabbage and oriental bunching onions after storage were 20% and 50%, respectively.

Anonymous (2005) reported that moreover, it is very regrettable that post harvest losses of fruits and vegetables are about 30% due to the lack of proper post harvest management and marketing system. In effect, it means that 30% of land, input and labor used to produce fruits and vegetables go to misuse.

Paull (1993) reported that estimates of postharvest losses of fruits and vegetables vary widely both in the developed and developing countries.

Okezie (1998) reported that postharvest food losses have been quoted as being 15-50% for horticultural products and 10-20% for grains and oil seeds.

Hossain *et al.* (1997) observed that the average estimated loss of tomato at farmers' level was 12%.

Rashid (1998) reported that the total value of vegetables produced in Bangladesh is around Tk. 19400 million, calculated at average retail price. About 70% of the vegetables pass through the marketing channels. If the spoilage is 10%, the loss comes to Tk. 1,462 millions. These losses are due to inadequate knowledge on harvesting, carrying, packaging, transport and storage techniques. In the vegetable marketing channels, traders suffer maximum losses, because they handle and transport more quantities from one place to another than any other intermediaries.

An investigation was carried out by Yadav *et al.* (2007) to assess the level of knowledge of mango orchardists regarding postharvest processing and marketing practices in Saharanpur and Bulandshahr districts of western Uttar Pradesh, India. The percentages of the orchardists had knowledge on postharvest management and grading were 52.13 and 51.06%, respectively. Most of the orchardists were not familiar with storage of frui1`ts after harvesting (60.64%).

2.3 Literatures Related to Relationships between Selected Characteristics of the Farmers and Knowledge

2.3.1 Age and knowledge

Rahman (2006) found in his study that age of the farmers had a significant and negative relationship with their knowledge on prawn culture. Similar results were observed by Sarker (2002), Kashem (1987), Hansara and Chopra (1986) in their respective studies.

Roy (2006) found in his study that age of the farmers had no significant relationship with their knowledge on boro rice cultivation. Similar results were observed by Khan (2005), Islam (2005) and Rahman (2004) in their respective studies.

Akhter (2003) found in his study that the age of the farmers had no significant relationship with their knowledge on agricultural activities.

Hossain (2003) reported that age of the farmers was not related to farmers' knowledge on modern Boro rice cultivation practices.

Sana (2003) found that age of the farmers was not related to their knowledge of shrimp culture.

Farhad (2003) concluded that age of the rural women farmers had significant negative relationship with their knowledge in using IPM in vegetable cultivation.

Sutradhar (2002) revealed that the age of the respondents had no relationship with their awareness on environmental degradation.

Uddin (2001) reported that age of the BSs had no significant relationship with their opinion on environmental hazards and associated problems due to continuous and intensive rice farming.

Hossain (2000) in his study found that age of the farmers had no significant relationship with their knowledge on Binadhan-6 technology.

Hanif (2000) found that in his study there was a positive significant relationship between age of the respondents and their awareness on environmental pollution in case of farmer field school (FFS) farmers. Also, it was found that there was a negative insignificant relationship between age of the farmers and their awareness on environmental pollution.

Hamid (1997) made a survey to determine the awareness of farmers on environment. He found that age of the farmers had negative relationship with their awareness on environmental pollution.

Mutaleb (1995) found that age of the farmers had no relationship with overall adoption of potato technologies.

Parveen (1995) revealed that the age of the farm women was not related with their knowledge on the use of fertilizers, pesticides, and irrigation water.

Baadgaonker (1984) in his study on the measurement of farmers' knowledge and factors affecting the adoption behaviour of groundnut cultivators of Uttar Kannada district of Karnataka state found no relationship between age of the farmers and their adoption behaviour.

Hoque (1984) conducted a study in some selected areas of Jessore district on the adoption of improved practices in sugarcane cultivation. He observed that age of the cane growers influenced the adoption of three improved practices namely, time of planting, planting method and recommended doses of fertilizers.

2.3.2 Level of education and knowledge

Rahman (2006) observed in his study that education level of the farmers had significant and positive relationship with their knowledge on prawn culture.

Roy (2005) in his study found that education level of the farmers had significant and positive relationship with their knowledge on boro rice cultivation.

Islam (2005) in his study explored that education level of the farmers had significant positive relationship with their knowledge on IPM in crop production.

Rahman (2004) in a study found that level of education of the farmers had significant and positive relationship with their knowledge on boro rice cultivation.

Hossain (2003) found that with increased level of education of the farmers, there was a corresponding increase in the knowledge level of modern Boro rice farmers.

Akhter (2003) found in his study that level of education of the farmers had a significant and positive relationship with their knowledge on agricultural activities.

Farhad (2003) found that the education of the rural women farmer had significant and positive relationship with their knowledge in using IPM in vegetable cultivation.

Sana (2003) showed that education of the respondents had positive relationship with their knowledge in shrimp cultivation.

Sutradhar (2002) revealed that academic qualification of the respondents had a significant positive relationship with their awareness on environmental degradation.

Uddin (2001) reported that education of the BSs had significant relationship with their opinion on environmental hazards and associated problems due to continuous and intensive rice farming.

Hossain (2000) found that education of the respondents had significant positive relationship with their knowledge on Binadhan-6.

Hanif (2000) found that in his study there was a positive significant relationship between education of the respondents and their awareness on environmental pollution.

Sarkar (1999) revealed that the level of education of the farmer had significant positive relationship with their perception on environmental degradation.

Hossain (1999) found that education of the farmers had significant positive relationship with the awareness on environmental degradation.

Islam *et al.* (1988) observed that education of the farmers had significant positive relationship with the awareness on environmental pollution.

Hamid (1997) found that education of the farmers had positive relationship with the awareness on environmental pollution in both cases of the progressive and less progressive village.

Miah and Rahman (1995) found that the level of education of the farmers had positive significant relationship with the awareness on farming environment.

Parveen (1995) found that the level of education of the farm women had a significant positive relationship with their knowledge on the use of fertilizer, pesticides and irrigation water.

2.3.3 Family size and knowledge

Rahman (2004) found in his study that family size of the farmers had no significant relationship with their knowledge on boro rice cultivation practices.

Hossain (2003) found that family size of the farmers was not significantly related to farmers' knowledge on modern Boro rice cultivation practices.

Farhad (2003) found that family size of rural women farmer had no significant relationship with their knowledge in using IPM in vegetable cultivation.

Sana (2003) revealed that family size of the farmers was not related to their knowledge of shrimp culture.

Sutradhar (2002) found that family size of the respondents had a significant positive relationship with their awareness on environmental degradation.

Hanif (2000) found that in his study there was a positive insignificant relationship between family size of the respondents and their awareness on environmental pollution.

Hossain (2000) found that family size of the farmers had significant positive relationship with their knowledge on Binadhan-6.

Alam (1997) in his study found that family size of the farmers had positive and significant relationship with their use of farm practices in rice cultivation.

Rathore and Shsktawat (1990) found that the knowledge about improved agricultural prctices of Bajra cultivation by farm women was found to be sognificant associated with their size.

Parveen (1995) revealed that family size of the farm women had a positive significant relationship with their knowledge on the use of fertilizer, pesticides and irrigation water.

Kashem (1987) in his study, however, did not find any significant relationship between family size and agricultural knowledge of the farmers.

Shidhu (1980) found that family size was not associated with the level of knowledge toward dairying.

2.3.4 Farm size and knowledge

Rahman (2006) examined in his study that farm size of the farmers had a significant relationship with knowledge on prawn culture.

Islam (2005) in his study explored that farm size of the farmers' had significant positive relationship with their knowledge on IPM in crop production.

Khan (2005) determined that farm size of the respondent had no significant relationship with their knowledge on maize cultivation.

Hossain (2003) reported that the farm size of the respondents had positive and significant relationship with their knowledge on modern Boro rice at 0.05 level of probability.

Farhad (2003) found that farm size of rural women farmer had a positive significant relationship with their knowledge in using IPM in vegetable cultivation.

Sana (2003) reported that farm size of the shrimp cultivators had no relationship with their knowledge of shrimp culture.

Sutradhar (2002) found that farm size of the respondents had a significant positive relationship with their awareness on environmental degradation.

Hanif (2000) found that there was a negative insignificant relationship between farm size of the respondents and their awareness on environmental pollution.

Hossain (2000) found that farm size of the farmers had no relationship with their knowledge on Binadhan-6.

Hamid (1995) found that area under cultivation of farmers had had no relationship with the awareness on environmental pollution.

Hamid (1997) found that area under cultivation of farmers had no relationship with the awareness on environmental pollution.

Parveen (1995) revealed that the homestead of the farm women had a positive significant relationship with their knowledge on use fertilizers, pesticides and irrigation water.

Miah and Rahman (1995) revealed that farm size of the farmers and awareness regarding farming environment were not significantly related.

2.3.5 Vegetable cultivation area and knowledge

Islam (2008) found that vegetable cultivation area had a positive and substantial significant relationship with knowledge on vegetables production activities by woman members in homestead area under world vision project.

2.3.6 Experience in vegetable cultivation and knowledge

Islam (2008) found that vegetable cultivation experience had a positive and substantial significant relationship with knowledge on vegetables production activities by woman members in homestead area under world vision project.

2.3.7 Annual income from vegetable and knowledge

Islam (2008) found that income from vegetable had a positive and substantial significant relationship with knowledge on vegetables production activities by woman members in homestead area under world vision project.

2.3.8 Commercialization of vegetable and knowledge

Islam (2007) found that commercialization had a significant positive relationship with adoption of BRRI dhan 29 production technologies by the farmers.

Islam (2002) found that majority of respondents marketed more than 75% of their total vegetables while they opted the rest for their own consumption.

Marsh and Coleman (1995) after conducting a study at Washington found that there was a significant relationship between value of products sold and adoption behaviour of the farmers.

Afrad (2002) found that the commercialization of the respondents had significant relationship with their attitude towards vegetable cultivation.

Raj and Knight (1977) conducted a research on the influence of farm practices attributes on innovation decision process by the farmers of Dharmapuri district in Tamilnadu, India. They found that profitability was significantly correlated with the adoption of recommended farm practices. They defined profitability as the

amount of production cost compared with sold cost. So, profitability as use by them is synonymous with the commercialization of the present study.

Ahaduzzaman (1999) conducted a study on the adoption of modern T. Aman technologies among the rice growers in Sadar Thana of Rangpur District. He found that commercialization of the farmers had no significant and positive relationship with their adoption of modern T. Aman technologies.

2.3.9 Annual family income and knowledge

Islam (2008) found that annual income had a positive and substantial significant relationship with knowledge on vegetables production activities by woman members in homestead area under world vision project.

Chowdhury (2010) found that annual income had a significant positive relationship with knowledge on maize cultivation in five selected villages of Shibalaya Upazila under Manikgonj District.

Hossain (2003) found that the annual income of the respondents had positive and significant relationship with their knowledge on modern Boro rice cultivation practices.

Farhad (2003) found that annual income of the rural women farmer had significant positive relationship with their knowledge in using IPM in vegetable cultivation.

Sutradhar (2002) revealed that annual family income of the respondents had a significant positive relationship with their awareness on environmental degradation.

Uddin (2001) reported that annual income of the BSs had no significant relationship with their opinion on environmental hazards and associated problems due to continuous and intensive rice farming.

Hanif (2000) found that in his study there was a negative insignificant relationship between annual income of the respondents and their awareness on environmental pollution.

Hossain (1999) found that family income of the farmers had significant positive relationships with their perception on environmental degradation.

Hamid (1997) found the annual income of the farmer had significant positive relationship with the awareness on environmental pollution in case of less progressive village but it was insignificant in case of progressive village.

Hamid (1995) found a positive relationship between family income of the farmers and their awareness on environmental pollution.

Khan (1993) found significant relationship between annual income of the farmers and their adoption of insecticides. Hossain and Crouch (1992) observed similar findings in case of improved farm practices in Bangladesh.

Hoque (1993) observed negative trend in his study but no significant relationship between the annual income of the cane growers and their use of recommended dose of fertilizer in sugarcane cultivation.

Singh (1991) found that income of the farmers was associated with the level of adoption of plant protection measures. He also found that low income farmers had greater tendency to apply less than the recommended doses and lack of knowledge was found as the major reasons for non-adoption.

Parveen (1995) stated that the annual income had a positive significant relationship with their knowledge on the use fertilizers, pesticides, and irrigation water.

2.3.10 Training on vegetable cultivation and knowledge

Islam (2008) found that training on vegetable cultivation had a positive and substantial significant relationship with knowledge on vegetables production activities by woman members in homestead area under world vision project.

Sana (2003) found that training received of the farmers had a positive significant relationship with their knowledge in shrimp culture.

Hossain (2001) found that the length of the training of the respondents had positive relationship with their knowledge of crop cultivation.

Mannan (2001) in his study found that the training received by the farmers had a positive significant relationship with their knowledge on food and nutrition.

2.3.11 Adoption of post harvest practices and knowledge

No findings were noticed on this aspect to the researcher at the time of reviewing literature.

2.3.12 Problem faced in vegetable cultivation and knowledge

No findings were noticed on this aspect to the researcher at the time of reviewing literature.

2.4 Conceptual Framework of the Study

In scientific research, selection and measurement of variables constitute on important task. The hypothesis of a research while constructed properly contains at least two important elements i.e. a dependent variable and an independent variable. A dependent variable in that factor which appears, disappears or varies on the researcher introduces, removes or varies as the independent variables. An independent variable is that factor which is manipulated by the researcher in this attempt to ascertain its relationship to an observed phenomenon. A simple conceptual framework for the study is shown in Figure 2.2.

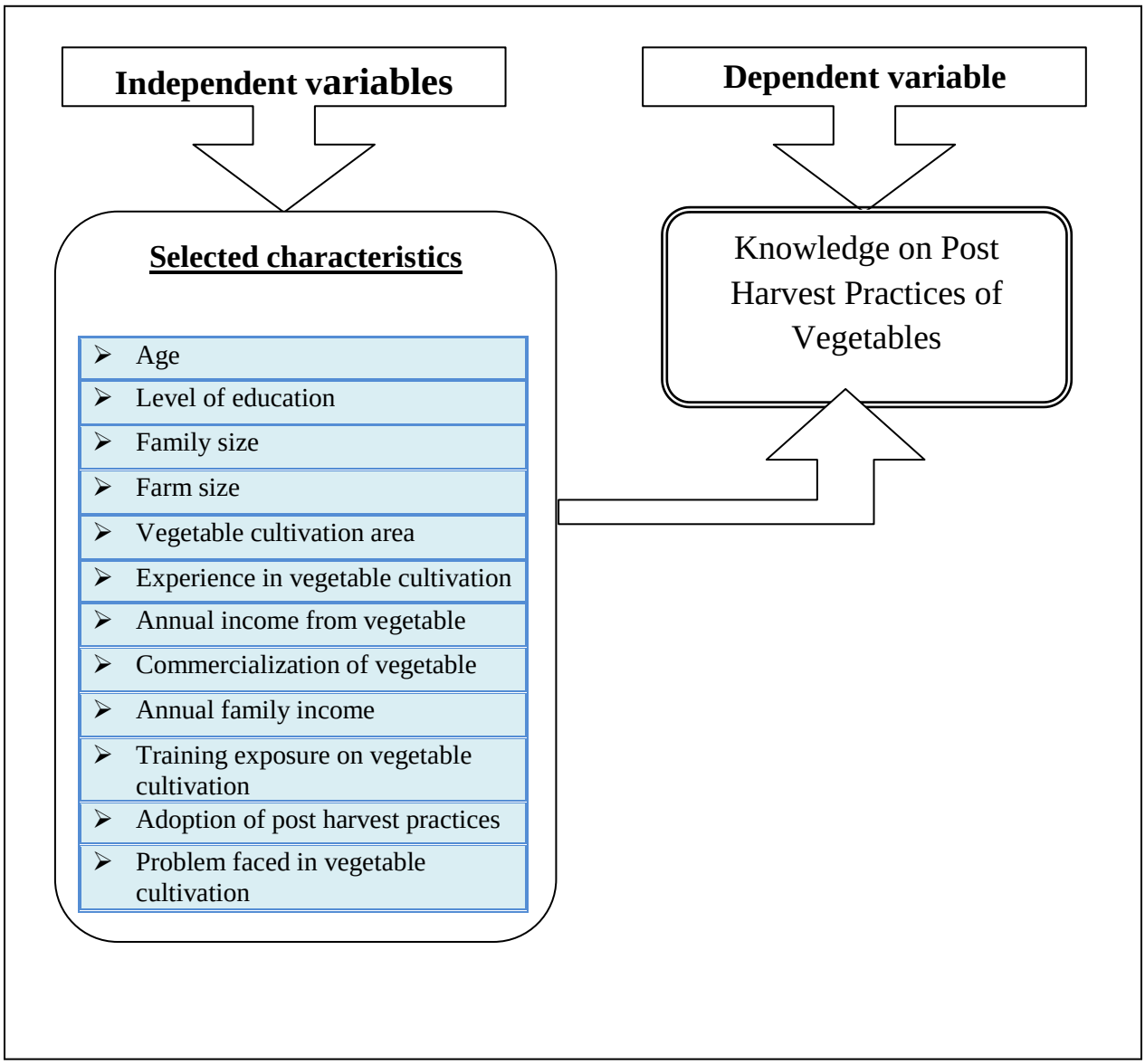


Figure 2.2 The Conceptual Framework of the Study

CHAPTER 3

MATERIALS AND MEHODS

In conducting a research study, methodological issue is one of the prime considerations for yielding of valid and reliable findings. Appropriate methodology enables the researcher to collect valid and reliable information and to analyze the information properly in order to arrive at correct conclusions. However, the methods and operational procedures followed in conducting this study has been described in the subsequent sections of this chapter.

3.1 The Locale of the Study

The study was conducted among the vegetable growers of six villages of Belgachi union of Alamdanga Upazila under Chuadanga District. Out of twelve unions of this Upazila, Belgachi union was purposively selected because vegetables are grown plenty in this union. From these union six villages (Belgachi, Kedarnagar, Kashipur, Bilchaklia, Faridpur, Damosh) were selected randomly from 15 villages of this union. The map of Bangladesh showing Chuadanga districts appears in the Figure 3.1. A map of Chuadanga district showing Alamdanga Upazilla and a map of Alamdanga Upazila showing the study area have been shown in Fig 3.2 and 3.3 respectively.

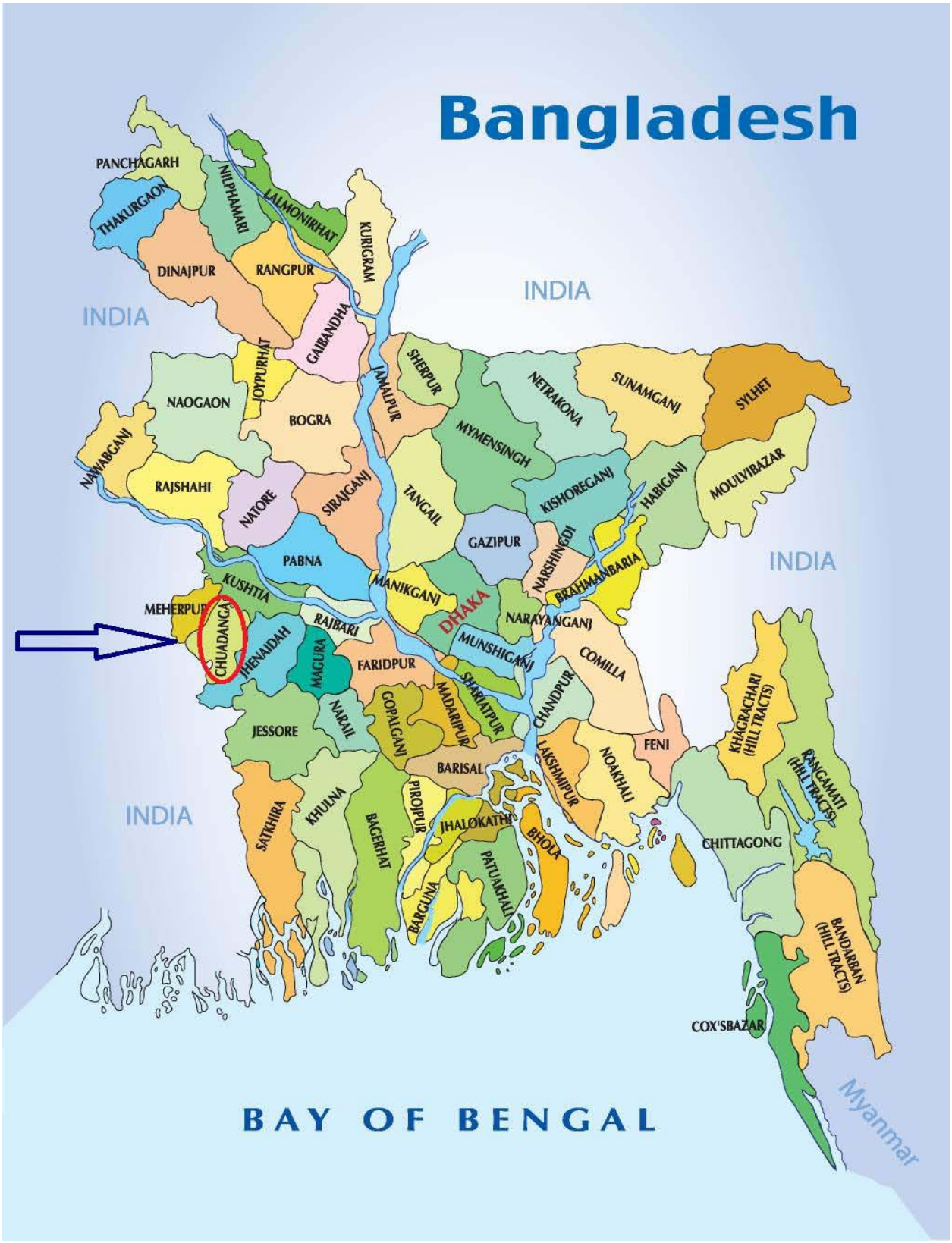


Figure 3.1 A Map of Bangladesh showing Chuadanga District

Figure 3.2 A Map of Chuadanga District showing Alamdanga Upazila

Figure 3.3 A map of Alamdanga Upazila showing the study area (Belgachi Union)

3.2 Population and Sample of the Study

A list of vegetable growers of the study area was prepared by the researchers himself with the help of the Sub Assistant Agriculture Officer (SAAO) of Alamdanga Upazila Agriculture Office. The list comprised a total 364 vegetable growers in the study area. These farmers constituted the population of this study. To make a respective sample 30 percent of the population was selected proportionately random sampling technique. Thus one hundred nine (109)

vegetable growers were selected as the sample of the study. The village-wise distribution of the population and sample of farmers are shown in Table 3.1.

Besides this 5 percent of the samples were selected randomly as reserves who were supposed to be interviewed only when a respondent in the original sample list was unavailable during data collection.

Table 3.1 Distribution of the population and sample of the respondents in six villages of Belgachi union with reserve list

Villages	Population (No. of total vegetable growers)	Sample Size (30%)	Reserve list (5%)
Belgachi	98	29	5
Kedarnagar	65	20	3
Kashipur	27	8	2
Bilchaklia	29	9	2
Faridpur	101	30	5
Damosh	44	13	2
Total	364	109	19

3.3 Data Collecting Instrument

In a social research, preparation of an interview schedule for collection of information with very careful consideration is necessary. Keeping this fact in mind the researcher prepared an interview schedule carefully for collecting data from the respondents. Objectives of the study were kept in view while preparing the interview schedule.

The initially prepared interview schedule was pre-tested among 15 respondents of the study area. The pretest was helpful to find out gaps and to locate faulty questions and statements. Alterations and adjustments were made in the schedule on the basis of experience of the pretest. English version of the interview schedule is shown in appendix-A.

3.4 Collection of Data

The researcher collected data from the sample farmers with the help of a pretested interview schedule. Before starting collection of data, the researchers met with the Sub Assistant Agriculture Officer of the respective blocks in order to explain the objectives of the study and requested them to provide necessary help and co-operation in collection of data. The local leaders of the area were also approached to render essential help. As a result of all these a good working atmosphere was created in the study area which was very helpful for collection of data by the researcher.

Before going to the respondents for interview they were informed earlier, so that they would be available in their respective area. The interviews were held individually in the house or farms of the respective respondent. The researcher established adequate rapport so that the respondents did not feel hesitant to provide actual information. Whenever any respondent faced difficulty in understanding a particular question, the researcher took care to explain the same clearly. No serious constraints were faced by the researcher in collecting data. Collection of data took 30 days from 15th January to 13th February, 2013.

3.5 Variables of the Study

In social research, the selection and measurement of variables constitute an important task. In this connection, the researcher looked into the literature to widen his understanding about the nature and scope of the variables involved in research studies. Ezkiel and Fox (1959) defined a variable as any measurable characteristics which can assume varying or different values in successive individual cases. The hypothesis of a research, while constructed properly, contains at least two important elements, an independent variable and a dependent variable. An independent variable is that factor which is manipulated by the researcher in his attempt to ascertain its relationships to an observed phenomenon (Townsend, 1953). A dependent variable is that factor which appears, disappears or varies as the experimenter introduces, removes or varies in the independent

variables. The dependent variable is often called the criterion or predicted variable, where as the independent variable is called the treatment, experimental and antecedent variable (Dalen, 1977).

3.6 Selection of Dependent and Independent Variables

Farmers' knowledge on the post harvest practices of selected vegetables was the main focus of this study and it was considered as the dependent variable.

For selection of independent variables the researcher went through the past related literature as far as available. He discussed with the researcher, experts in the relevant fields and research fellows in agricultural and related disciplines. He also carefully noticed the various characteristics of the farmers of the study. Availability of time, money and other resources were also kept in view in selected the variables. Characteristics of the farmers like age, level of education, family member, farm size, vegetable cultivation area, experience in vegetable cultivation, annual income from vegetable, annual family income, commercialization of vegetable, training on vegetable cultivation, adoption of post harvest technology and problem faced in vegetable cultivation were selected as the independent variables.

3.7 Measurement of Variables

In order to conduct the study in accordance with the objectives, it was necessary to measure the selected variables. This section contains procedures for measurement of both independent as well as dependent variables of the study. The procedures followed in measuring the variables are presented below:

3.7.1 Measurement of independent variables

It was pertinent to follow a methodological procedure for measuring the selected variables in order to contact the study in accordance with the objectives already formulated. The procedures for measuring the independent variables are described below:

3.7.1.1 Age

Age of a respondent was measured in terms of years from birth to the time of interview which was found on the basis of response (Azad, 2003). A score of one (1) was assigned for each year of age. Question regarding this variable appears in item no. 1 in the interview schedule (Appendix-A).

3.7.1.2 Level of Education

Education was measured in terms of one's year of schooling. One score was given for passing each year in an educational institution (Amin, 2004). For example, if the respondent passed the S.S.C. examination, his education score was given as 10, if passed the final examination of class Seven (VII), his education scores was given as 7. If the respondent did not know how to read and write, his education score was given as '0' (zero). A score of 0.5 (half) was given to that respondent who could sign his/her name only. Question regarding this variable appears in the item no. 2 in the interview schedule (Appendix-A).

3.7.1.3 Family size

The family size was measured by the total number of members in the family of a respondent. The family members included family head and other dependent members like husband/wife, children, etc. who lived and ate together. A unit score 1 was assigned for each member of the family. If a respondent had five members in his/her family, his/her family size score was given as 5 (Khan, 2004). Question regarding this variable appears in the item no. 3 in the interview schedule (Appendix-A).

3.7.1.4 Farm size

Farm land is the most important capital of a farmer and the farm size can influence on many personal characteristics of a farmer. Farm size of the farmer was measured by the land area possessed by him. Data obtained in response to questions under item No. 4 of the interview schedule (Appendix-A) formed the basis for determining the farm size of the respondent. Farm size was computed by using the following formula:

Farm size = $A_1 + A_2 + A_3 + \frac{1}{2}(A_4 + A_5) + A_6 + A_7$

A_1 = Homestead Area

A_2 = Own land under own cultivation

A_3 = Land taken on lease from others

A_4 = Land taken on borga from others

A_5 = Land given to others as borga

A_6 = Pond

A_7 = Fallow land

The respondent farmers indicated their farm size in local unit. Finally, it was converted into hectare and was considered as the farm size of the respondents.

3.7.1.5 Vegetable cultivation area

Vegetable cultivation area was measured by the area of land under his/her management only for vegetable cultivation. The unit of measurement was in ha and was considered as the vegetable cultivation area of a respondent.

3.7.1.6 Experience in vegetable cultivation

Vegetable farming experience of the respondent was measured by the number of years a respondent engaged in vegetable cultivation. The measurement included from the year of starting of first vegetables cultivation till the year of data collection. A score of one (1) was assigned for each year of experience.

3.7.1.7 Annual family income

Annual income of a respondent was measured in ‘000’ taka on the basis of total yearly earning from agricultural and non agricultural sources by the respondent himself and other family members.

3.7.1.8 Annual income from vegetable cultivation:

Income from vegetable cultivation of the respondents was measured in thousand taka on the basis of total annual income from the value of vegetable production. It was expressed in '000' taka.

3.7.1.9 Commercialization of vegetable

Commercialization score of a farmer was determined on the basis of value of crops sold out of the total value of crops raised. As developed by Karim and Mahboob (1974) and used by Ali (2008) the following formula was used in computing the commercialization of vegetable score of a farmer:

$$\text{Commercialization score} = \frac{\text{Value of sold vegetable}}{\text{Total value of raised vegetable}} \text{x}100$$

Relevant market price was used in determining the commercialization score of an individual. Commercialization score could range from 0 to 100, while 0 indicating no commercialization and 100 indicating very high commercialization.

3.7.1.10 Training on vegetable cultivation

Training was measured by the total number of days a respondent received training in his/her life on vegetable cultivation. A score of 1 (one) was given to a respondent for every day of training. A zero (0) score was assigned for no training exposure.

3.7.1.11 Adoption of post harvest practices

Adoption of post harvest practices of respondent was measured by asking 10 selected statements related to post harvest practices. A four point scale was used and the respondents were asked to choose one response among four alternative responses as regularly, occasionally, rarely and not at all. Scores were assigned to the responses as the following manner:

Extent of adoption	Weights
Regularly	3
Occasionally	2
Rarely	1
Not at all	0

The adoption of post harvest practices was therefore, determined by adding the total scores against all the 10 selected post harvest practices. Thus, the adoption of post harvest practices could range from 0 to 30, where '0' indicated no adoption and 30 indicated highest adoption.

3.7.1.12 Problem faced in vegetable cultivation

Twelve problems were selected for the study after thorough consultation with supervisor and relevant experts. The respondents were asked to respond to four alternative responses as 'severe problem', 'moderate problem', 'little problem' and 'no problem' for each of twelve selected problems. Scores were assigned to those alternative responses as 3, 2, 1, and 0, respectively. Score for particular problem was measured by Problem Faced Index (PFI) as follows:

$$\mathbf{PFI = (P_s \times 3) + (P_m \times 2) + (P_l \times 1) + (P_n \times 0)}$$

Where,

PFI = Problem Faced Index

P_s = Number of respondents faced severe problem

P_m = Number of respondents faced moderate problem

P_l = Number of respondents faced little problem

P_n = Number of respondents faced no problem

Score of problem faced in vegetable cultivation of a respondent was computed by adding all the scores obtained by those responses from all the nine problem items. Thus, the problem faced in vegetable cultivation of the vegetable growers could

range from 0 to 27 where ‘0’ indicated no problem and 27 indicated highest problem in vegetable cultivation.

3.7.2 Measurement of dependent variables

Knowledge refers to the ability of a respondent to recall or recognize items of information related to anything. Knowledge on post harvest practices of vegetables was the dependent variable of the study. It was measured based on knowledge of the growers on post harvest practices of vegetables. The knowledge of a farmer on post harvest practices of vegetables was determined by computing a knowledge score based on the responses against 26 statements regarding post harvest practices. These statements were collected after thorough consulting with relevant experts reviewing of existing literatures and searching websites. Each of the statements carried a full weight of 1(one). Respondent were asked to choose one response against alternative responses as right, wrong and don’t know. For each right response, a farmer received a full weight of 1, for each wrong or no response (as don’t know) s/he received 0 (zero). The response as “don’t know” helped to find the responses more accurately. Thus, knowledge score of a farmer could range from 0 to 26, where ‘0’ indicated very low knowledge and 26 indicated highest level of knowledge on post harvest practices of vegetables.

3.8 Statement of the Hypotheses

As defined by Goode and Hatt (1952) a hypothesis is “a proposition which can be put to test to determine its validity. It may seem contrary to, or in accord with common sense. It may prove to be correct or incorrect. In any event, however, it leads to an empirical test.”

3.8.1 Research hypotheses

In the light of the objectives of the study and variables selected, the following research hypotheses were formulated to test them in. The research hypotheses were stated in positive form, the hypotheses were as follows:

"Each of the selected characteristics of the farmers had contribution to their knowledge on postharvest practices of vegetable."

3.8.2 Null hypotheses

In order to conduct statistical tests, the research hypotheses were converted to null form. Hence, the null hypotheses were as follows:

"Each of the selected characteristics of the farmers had no contribution to their knowledge on postharvest practices of vegetables."

3.9 Data Processing

3.9.1 Editing

The collected raw data were examined thoroughly to detect errors and omissions. As a matter of fact the researcher made a careful scrutiny of the completed interview schedule to make sure that necessary data were entered as complete as possible and well arranged to facilitate coding and tabulation. Very minor mistakes were detected by doing this, which were corrected promptly.

3.9.2 Coding and tabulation

Having consulted with the research supervisor and co-supervisor, the investigator prepared a detailed coding plan. In case of qualitative data, suitable scoring techniques were followed by putting proper weight age against each of the traits to transform the data into quantitative forms. These were then tabulated in accordance with the objective of the study.

3.9.3 Categorization of data

Following coding operation, the collected raw data as well as the respondents were classified into various categories to facilitate the description of the independent and dependent variables. These categories were developed for each of the variables by considering the nature of distribution of the data and extensive literature review. The procedures for categorization have been discussed while describing the variables under consideration in chapter iv.

3.10 Statistical Analysis

The statistical measures such as range, mean, standard deviation, percentage, rank order were used for describing both the independent and dependent variables. Tables were also used in presenting data for clarity of understanding. Initially, Pearson Product Moment correlation was run to determine the relationship between the selected characteristics of the vegetable farmers with their knowledge on postharvest practices of vegetable. To find out the contribution of selected characteristics of the vegetable growers to their knowledge on postharvest practices, step-wise multiple regression was used. Five percent (0.05) level of probability was used as the basis for rejection of a null hypothesis throughout the study. Co-efficient values significant at 0.05 level is indicated by one asterisk (*), and that at 0.01 level by two asterisks (**) and at 0.001 level or above by three asterisks (***). For determining severity of the problems, rank order was made based on the descending order of the Problems Faced Index (PFI).

CHAPTER IV

FINDINGS AND DISCUSSION

This chapter deals with the result and discussion of present research work. Necessary explanations and appropriate interpretations have also been made showing possible and logical basis of the findings. However, for convenience of the discussions, the findings are systematically presented in the following sections.

4.1 Characteristics of the Vegetable Growers

This section deals with the characteristics of vegetable growers which were assumed to be associated with the knowledge on postharvest practices of vegetables. Different farmers possess different characteristics which are focused by his/her behavior. In this section 12 characteristics have been discussed. The selected characteristics of the farmers were; age, level of education, family size, farm size, vegetable cultivation area, experience in vegetable cultivation, annual family income, annual income from vegetable cultivation, commercialization of vegetables, training exposure on vegetable cultivation, adoption of post harvest practices, problem faced in vegetable cultivation. Measuring unit, range, mean, standard deviations and coefficient of variation of those characteristics of vegetable growers were described in this section. Table 4.1 provides a summary profile of vegetable growers' characteristics.

Table 4.1 Characteristics profile of the respondents

Sl. No.	Characteristics (with measuring unit)	Range		Mean	Standard deviation	CV (%)
		Possible	Observed			
01	Age (years)	Unknown	22 - 70	42.07	9.99	23.75
02	Level of education (schooling years)	Unknown	0 - 12	4.46	3.84	86.10
03	Family size (number of members)	Unknown	2-11	5.63	1.69	30.02
04	Farm size (hectare)	Unknown	.06 - 2.17	0.98	0.32	32.65
05	Vegetable cultivation area (hectare)	Unknown	0.01 - 1.07	.15	0.16	106.67
06	Experience in vegetable cultivation (years)	Unknown	2 - 30	10.02	5.42	54.09
07	Annual family income (‘000’Taka)	Unknown	49.86 – 326.50	126.12	42.63	33.80
08	Annual income from vegetable cultivation (‘000’Taka)	Unknown	1.30 – 136	27.67	22.14	80.01
09	Commercialization of vegetables (score)	Unknown	0 - 98	72.22	25.73	35.63
10	Training exposure on vegetable cultivation (number of days)	Unknown	00 - 14	2.97	2.76	92.93
11	Adoption of post harvest practices (score)	0 - 30	6 - 28	17.29	4.14	23.94
12	Problem faced in vegetable cultivation (score)	0 - 27	10 - 25	17.68	3.54	20.02

4.1.1 Age

Age of the respondents varied from 22 to 70 years, the average being 42.07 years with the standard deviation of 9.99. According to their age, the respondents were classified into three categories as “young aged” (up to 35 years), “middle aged” (36- 50 years) and “old aged” (above 50 years). The distribution of the farmers according to their age is shown in Table 4.2.

Table 4.2 Distribution of the farmers according to their age

Categories	Basis of categorization (year)	Respondents	
		Numbers	Percent
Young	up to 35	32	29.40
Middle aged	36-50	55	50.50
Old	Above 50	22	20.20
Total		109	100

Data represented in Table 4.2 indicate that slightly above half (50.50 percent) of the respondents were middle aged as compared to 29.40 percent being young and 20.20 percent old. Findings again revealed that about four fifth (79.90 percent) of the respondents were young to middle aged. Therefore, it could be said that decision regarding the farming practices in the study area were expected to be considerably influenced by the young and middle aged farmers.

4.1.2 Level of Education

Education level of the respondents ranged from 0-12 in accordance with year of schooling. The average education score of the respondents was 4.46 with a standard deviation of 3.84. On the basis of their level of education, the farmers were classified into five categories as shown in Table 4.3.

Table 4.3 Distribution of the farmers according to their level of education

Categories	Basis of Categorization (schooling years)	Respondents	
		Number	Percent
Illiterate	0	14	12.8
Can sign only	0.5	27	24.8
Primary	1-5	26	23.9
Secondary	6-10	41	37.6
Above secondary	above 10	1	.9
Total		109	100

Data shown in the Table 4.3 indicated that 37.6 percent of the farmers had secondary level of education compared to 12.8 percent illiterate, 24.8 percent could sign their name only, 23.9 percent had primary level education and only 0.9 percent had above secondary level of education.

Education helps the farmers to face the adverse condition and adjust with unfavorable condition through reading leaflets, booklets, books and other printed materials in this case. Education helps the farmers to broaden their outlook and expand mental horizon by helping them to develop favorable attitude, correct perception and knowledge about production technology and postharvest practices. Comparatively educated person is relatively more responsive to the technology and new innovation. The findings of this study, however, indicate that 37.6 percent of the farmers were illiterate or could sign their name only which is supposed to face a great difficulty in adjusting with the unfavorable condition regarding knowledge on postharvest practices. Such consideration indicates the need for improving literacy level among the farmers for adjusting the knowledge about postharvest practices of vegetables. Although 37.6 percent farmers had secondary education but they are engaged in production of rice and wheat in order to maintain food security. So, motivational program should be arranged to make farmers' attention in vegetable production and post harvest practices.

4.1.3 Family Size

The number of family members of the respondents ranged from 2 to 11 with an average of 5.61 and standard deviation of 1.69. Based on the family size the respondents were classified into three categories as small, medium and large family as shown in Table 4.4.

Table 4.4 Distribution of the farmers according to their family size

Categories (No. of members)	Basis of categorization (No. of family member)	Respondents	
		Numbers	Percent
Small family	up to 4	28	25.7
Medium family	5-7	64	58.7
Large family	Above 7	17	15.6
Total		109	100

Data furnished in the Table 4.4 indicated that the highest proportion (58.7%) of the respondents had medium family size consisting of 5 to 7 members, while 25.7% of the respondents belonged to the category of small family compared to 15.6% of them having large family size. Data indicated that the average family size (5.61) of the respondents in the study area is equal to the national average of 5.6 (BBS, 2009).

4.1.4 Farm Size

Farm size of the respondents ranged from 0.06 hectare to 2.17 hectares with the mean of 0.38 and standard deviation of 0.33. On the basis of their farm size, the farmers were classified into three categories followed by DAE (1999) as shown in Table 4.5.

Table 4.5 Distribution of farmers according to their farm size

Categories	Basis of categorization (ha)	Respondents	
		Number	Percent
Marginal farm	up to 0.2	23	21.10
Small farm	0.2 – 1.0	77	70.60
Medium farm	1.01 –3.0	9	8.30
Total		109	100

Data presented in the Table 4.5 demonstrated that highest proportion (70.60percent) of the farmers had small farm compared to 21.10 percent having marginal farm and only 8.03 percent had medium farm. The findings indicated that

overwhelming majority (91.70 percent) of the farmers had marginal to small farm size. In Bangladesh most of the farmers live on below a subsistence level and this in one of the vital reasons for not adopting improved farming practices in their farm as well as having lower knowledge on postharvest practices.

4.1.5 Vegetable cultivation area

Vegetable cultivation area of the respondents varied from 0.01 to 1.07 hectare, the average being 0.15 ha with the standard deviation of 0.16. The respondents were classified into three categories on the basis of their vegetable cultivation area as shown in Table 4.6

Table 4.6 Distribution of farmers according to vegetable production area

Categories	Basis of categorization (ha)	Respondents	
		Number	Percent
Small area	up to 0.2	88	80.70
Medium area	0.2 – 0.5	18	16.5
Large area	Above 0.5	3	2.8
Total		109	100

Data furnished in Table 4.6 specified that overwhelming majority (80.7 percent) of the respondents had small area compared to 16.5 percent had medium area and only 2.8 percent had large area for vegetable production. Therefore, it could be said that the choice of vegetable production regarding the farming practices in the study area are expected to be considerably influenced by the small and medium land of the farmers. So, they need comparatively cheaper technologies and target oriented special extension service for vegetable production.

4.1.6 Experience in vegetable production

Computed scores of the farmers about experience in vegetable production ranged from 2 to 30 years with a mean of 10.02 and standard deviation of 5.42. On the basis of farming experience, the respondents were classified into three categories as follows in Table 4.7.

Table 4.7 Distribution of farmers according to their farming experience in vegetable production

Categories (year)	Basis of categorization (Years)	Respondents	
		Number	Percent
Short farming experience	up to 5	26	23.9
Medium farming experience	6-10	44	40.4
Long farming experience	above 10	39	35.8
Total		109	100

Data contained in Table 4.7 showing that 40.4 percent of the farmers had medium farming experience, where as 35.8 percent had long farming experience and 23.9 percent had short farming experience. Farming experience is helpful to increase knowledge, improve skill and change attitude of the farmers. It also builds confidence of the farmers for making appropriate decisions at the time of need. Above three fourth (76.2 percent) of the farmers had medium to long farming experience. Generally, experience helps to cope up any problematic situation. Therefore, the higher experience might be increased the risk bearing ability of the farmers in vegetable cultivation as well as increase their knowledge on postharvest practices.

4.1.7 Annual family income

Annual family income of the respondents ranged from 49.86 to 326.50 thousand taka. The mean was 126.12 thousand taka and standard deviation was 42.63. On the basis of annual family income, the respondents were categorized into three groups as shown in Table 4.8.

Table 4.8 Distribution of farmers regarding annual family income

Categories	Basis of categorization ('000' taka)	Respondents	
		Number	Percent
Low income	up to 100	31	28.4
Medium income	100.1-220	75	68.8
High income	above 220	3	2.8
Total		109	100

Data shown in Table 4.8 presented that the highest proportion (68.8 percent) of the respondents had medium family income while 28.4 and 2.8 percent of the respondents had low and high annual family income respectively.

The gross annual family income of a farmer is an important indicator of how much s/he can invest in his farming. Generally higher income encourages one's integrity to achieve better performance and to show his/her individual better status in the society. The higher income increases the risk taking capacity of the farmers' vegetable production. Farmers with low income generally invest less in their farms. It is therefore, likely that a considerable portion of farmers may face difficulty in vegetable production.

4.1.8 Annual income from vegetable cultivation

Annual income from vegetable cultivation of the respondent ranged from 1.30 to 136 thousand taka. The mean was 27.67 thousand taka and standard deviation was 22.14. On the basis of annual income from vegetable, the respondents were categorized into three groups as shown in Table 4.9.

Table 4.9 Distribution of farmers according to their annual income from vegetable cultivation

Categories	Basis of categorization ('000' taka)	Respondents	
		Number	Percent
Low income	up to 20	49	45.0
Medium income	20.1-50	45	41.3
High income	above 50	15	13.8
Total		109	100

Data shown in the Table 4.9 indicated that 49 percent of the farmers had low income where 45 percent farmers had medium and 13.8 percent had high family income from vegetable cultivation. Thus, the overwhelming 86.3 percent of the farmers had low to medium annual income from vegetable cultivation.

4.1.9 Commercialization of vegetables

Computed commercialization of vegetable scores ranged from 00 to 98 percent with a mean of 72.22 percent and standard deviation of 25.73. On the basis of commercialization of vegetable scores, the respondents were classified into three categories as shown in Table 4.10.

Table 4.10 Distribution of farmers according to their commercialization of vegetables

Categories	Basis of categorization (%)	Respondents	
		Number	Percent
Low	up to 50	23	21.10
Medium	50.1-75	21	19.30
High	Above 75	65	59.60
Total		109	100

Data presented in Table 4.10 indicated that majority (59.60 percent) of the respondents of the study had high commercialization of vegetable by keeping very small portion for family consumption. Moreover it was observed that 78.90

percent of vegetable growers had medium to high commercialization of vegetable. Therefore it could be said that they reasonably desire to market their produce for cash money.

4.1.10 Training exposure on vegetable cultivation

The score of training exposure on vegetable cultivation of the farmers ranged from 0-14 days. The mean was 2.97 days and standard deviation was 2.76. On the basis of training exposure on vegetable cultivation, the respondents were categorized into three groups as shown in Table 4.11.

Table 4.11 Distribution of the farmers according to their training exposure on vegetable cultivation

Categories (days)	Basis of categorization (Days)	Respondents	
		Number	Percent
No training	0	18	16.50
Low training	1-7	82	75.20
Medium training	Above 7	9	8.30
Total		109	100

Data presented in the Table 4.11 showed that three fourth (75.20%) of the farmers had low training exposure; while 16.50 percent of the farmers had no training exposure and 8.3% percent had medium exposure. It means that an overwhelming majority (91.70 percent) of the farmers had no or low training exposure. It is logical that there is always a relationship between training exposure and knowledge on post harvest practices. Because training received develops the farmers' knowledge, skill, and attitude in positive manner. The findings suggest that training experience might be the most important factor for the respondents to change their knowledge on post harvest practices of vegetables.

4.1.11 Adoption of post harvest practices of vegetables

Adoption of post harvest practices of vegetables of the respondents ranged from 6 to 28. The mean was 17.29 and standard deviation was 2.76. On the basis of

adoption of postharvest practices of vegetables, the respondents were categorized into three groups as shown in Table 4.12.

Table 4.12 Distribution of the farmers according to adoption of postharvest practices of vegetables

Categories	Basis of categorization (Score)	Respondents	
		Number	Percent
Low	up to 10	4	3.7
Medium	11-20	80	73.4
High	Above 20	25	22.9
Total		109	100

Data shown in the Table 4.12 indicated that majority (73.4 percent) of the farmers had medium adoption while 22.29 percent farmers had high and 3.7 percent had low adoption of postharvest of practices.

4.1.12 Problem faced in vegetable cultivation

Problem defined by Goode (1945) is any significant perplexing and challenging situation, real and artificial, the solution of which requires reflective “thinking”. Problem faced, therefore, refers to the extent to which individual faces difficult situations about which something needs to be done. The scores of problem faced in vegetable cultivation of the respondents ranged from 10 to 25 against the possible range of 0 – 27 with an average of 17.68 and standard deviation of 3.54. Based on the observed scores of problem faced in vegetable cultivation, the respondents were classified into the two categories i.e. medium problem and high problem faced. The distribution has been shown in Table 4.13.

Table 4.13 Distribution of the farmers according to problem faced in vegetable cultivation

Categories	Basis of categorization (Score)	Respondents	
		Number	Percent
Medium	up to 18	66	60.6
High	Above 18	43	39.4
Total		109	100

About 60.6 percent of the respondents faced medium problem in vegetable production activities and 39.4 percent faced high problems. Findings again reveal that all of the farmers faced medium to high problems in vegetable production. It is quite logical that farmers facing lower problems could minimize their losses in post harvest.

4.2 Knowledge on Post Harvest Practices of Vegetables

Knowledge on postharvest practices of selected vegetables score of the respondents ranged from 6 to 25 against the possible range of 0 – 26 having an average of 18.28 and standard deviation of 3.46. On the basis of knowledge scores, the respondents were classified into three categories namely, 'low knowledge', 'medium knowledge' and 'high knowledge'. The distribution of the respondents according to their knowledge on post harvest practices of vegetables is given in Table 4.15.

Table 4.14 Distribution of the vegetable growers according to their knowledge on postharvest practices of vegetables

Categories (score)	Respondents		Mean	Standard deviation
	Number	Percent		
Low knowledge (up to 13)	9	8.3	18.28	3.46
Medium knowledge (14-19)	61	56		
High knowledge (Above 19)	39	35.8		
Total	109	100.0		

Data of Table 4.14 show that 56 percent of the respondents felt in medium knowledge category followed by 35.8 percent in high knowledge category and only 8.3 percent in low knowledge category. Knowledge is to be considered as vision of an explanation in any aspect of the situation regarding vegetable cultivation. It is act or state of understanding; clear perception of fact or truth, that helps an individual to foresee the consequence he may have to face in future. It makes individuals to become rational and conscious about related field. To perform optimum production, vegetable growers should have adequate knowledge on different aspects of postharvest practices.

4.3 Contribution of the Selected Characteristics of Farmers on The Knowledge on Postharvest Practices of Vegetables

For this study twelve characteristics of the respondent were selected and each of the characteristics was treated as independent variables. The selected characteristics were age (x_1), level of education (x_2), family size (x_3), farm size (x_4), vegetable cultivation area (x_5), experience in vegetable cultivation (x_6), annual family income (x_7), annual income from vegetable cultivation (x_8), commercialization of vegetable (x_9), training exposure on vegetable cultivation (x_{10}), adoption of post harvest practices (x_{11}) and problem faced in vegetable cultivation (x_{12}). Knowledge on post harvest practices of selected vegetables (Y) was the only dependent variable of this study. Before exploring contribution of the selected characteristics of the vegetable growers to their knowledge, Pearson Product Moment correlation was run to find out the relation between the selected characteristics of the vegetable farmers and their knowledge on postharvest practices of vegetables. From this correlation test, it was found that age, level of education, experience in vegetable cultivation, training exposure on vegetable cultivation and adoption of postharvest practices of the farmers had significant positive and problem faced in vegetable cultivation had significant negative relationship with their knowledge on postharvest practices of vegetables. Beside these six characteristics, rest six characteristics of the farmers (family size, farm size, vegetable cultivation area, annual family income, and annual income from

vegetable cultivation) had no significant relationship with their knowledge on postharvest practices of vegetables (Table 4.15). Intercorrelation among all the variables may be seen in Appendix-B.

Table 4.15 Co-efficient of correlation showing relationship between selected characteristics of the farmers and knowledge on postharvest practices of vegetables

(n= 109 with df 107)

Dependent variable	Independent variable	Computed value "r"	Tabulated value of "r"	
			at 0.05 level	at 0.01 level
Knowledge on post harvest practices of vegetables	1. Age	0.197*	0.186	0.240
	2. Level of education	0.216*		
	3. Family size	0.094 NS		
	4. Farm size	0.091 NS		
	5. Vegetable cultivation area	0.142 NS		
	6. Experience in vegetable cultivation	0.226*		
	7. Annual family income	0.146 NS		
	8. Annual income from vegetable cultivation	0.178 NS		
	9. Commercialization of vegetables	0.067 NS		
	10. Training exposure on vegetable cultivation	0.261**		
	11. Adoption of postharvest practices	0.266**		
	12. Problem faced in vegetable cultivation	-0.231**		

NS Not significant

* Significant at 0.05 level of probability

** Significant at 0.01 level of probability

Then full model regression analysis was run with selected 12 independent variables. But it was observed that the full model regression results were misleading due to the existence of interrelationships among the independent variables. Therefore, in order to avoid the misleading results and to determine the

best explanatory variables, the method of step-wise multiple regressions was administrated and 12 independent variables were fitted together in step-wise multiple regression analysis. Table 4.18 shows the summarized results of step-wise multiple regression analysis with 12 independent variables on the respondents' knowledge on post harvest practices of vegetables. It was observed that out of 12 variables 5 independent variables namely level of education (x_2), experience in vegetable cultivation (x_6), training exposure on vegetable cultivation (x_{10}), adoption of post harvest practices (x_{11}) and problem faced in vegetable cultivation (x_{12}) were entered into the regression equation. Other seven variables were not entered into regression equation. The regression equation so obtained is presented below:

$$Y = 16.903 + 0.162X_{11} + 0.161\ X_{10} - 0.220X_{12} + 0.228X_2 + 0.216X_6$$

Table 4.16 Summary of stepwise multiple regression analysis showing the contribution of selected characteristics of the farmers to their knowledge on postharvest practices of vegetables

Variables entered	Standardized Partial 'b' Coefficients	Value of 't' (with probability level)	Adjusted R^2	Increase in R^2	Variation explained in percent
Adoption of post harvest practices (x_{11})	0.162	1.811 (0.073)	0.062	0.062	6.2
Training exposure on vegetable cultivation (x_{10})	0.161	1.772 (0.079)	0.098	0.036	3.6
Problem faced in vegetable (x_{12})	-0.220	-2.232 (0.013)	0.136	0.038	3.8
Level of education (x_2)	0.228	2.526 (0.013)	0.160	0.024	2.4
Experience in vegetable cultivation (x_6)	0.216	2.411 (0.018)	0.197	0.037	3.7
Total				0.197	19.70

Multiple R = 0.484
R-square = 0.234
Adjusted R-square = 0.197
F-ratio = 6.305
Standard error of estimate = 3.14
Constant =16.903

The multiple R and R^2 values were found 0.484 and 0.234 respectively and the corresponding F-ratio was 6.305 which were significant at 0.000 levels. For determining unique contribution on knowledge on post harvest practices of selected vegetables of each of the five variables the increase in R^2 value was determined. These five variables combinedly explained 19.7 percent of the total contribution on knowledge on post harvest practices of vegetables. Adoption of postharvest practices had the highest contribution (6.2 percent of the variation) followed by problem faced in vegetable cultivation 3.8 percent, experience in vegetable cultivation 3.7 percent training exposure on vegetable cultivation 3.6 percent and level of education 2.4 percent variation in knowledge on postharvest practices of vegetables.

Table 4.16 showed that adoption of postharvest practices, training exposure on vegetable cultivation, problem faced in vegetable cultivation, level of education and experience in vegetable cultivation had significant contribution to knowledge on postharvest practices of vegetables i.e. the farmers who had more adoption of postharvest practices, training exposure on vegetable cultivation, adoption of postharvest practices, problem faced in vegetable cultivation, level of education, experience in vegetable cultivation and less problem faced in vegetable cultivation were found to have more knowledge on post harvest practices of vegetables and in this connection, some predictive importance has been briefly discussed below:

Adoption of post harvest practices

From stepwise multiple regressions, it was found that adoption of postharvest practices of the respondent had highest contribution in their knowledge on postharvest practices of vegetables. Correlation matrix also showed that adoption of post harvest practices of the respondents had significant positive relationship with their knowledge on post harvest practices of vegetables. (Appendix-B and Table 4.15).

Postharvest activities include harvesting, handling, storage, processing, packaging, transportation, marketing etc. Adoption of appropriate postharvest practices helps to increase knowledge on postharvest practices of vegetables as well as minimize post harvest losses.

Problem faced in vegetable cultivation

Stepwise multiple regressions showed that problem faced in vegetable cultivation of the respondents had negative contribution to their knowledge on postharvest practices of vegetables and it was found to be the 2nd highest contributor. Correlation matrix also showed that problem faced in vegetable cultivation of the respondents had significant negative relationship with their knowledge on post harvest practices of selected vegetables. (Appendix-B and Table 4.15).

Problem is a situation, matter, or person that presents perplexity or difficulty. It is negative situation that a farmer faces in his farming. It results negativity on farming. Farmers facing no or low problem in farming, help to go for more cultivation and for that reason it helps to gain more knowledge. That means if farmer face low problem in vegetable cultivation it will encourage him/her to go for more vegetable production which ultimately helps to gain knowledge on post harvest practices of vegetables.

Experience in vegetable cultivation

From stepwise multiple regressions, it was found that experience in vegetable cultivation of the respondent had 3rd highest contribution to their knowledge on postharvest practices of vegetables. Correlation matrix also showed that experience in vegetable cultivation of the respondents had significant positive relationship with their knowledge on postharvest practices of vegetables (Appendix-B and Table 4.15).

A farmers having long farming experience will have more knowledge. Farming experience is helpful to increase knowledge, improve skill and change attitude of the farmers. It also builds confidence of the farmers for making appropriate

decisions at the time of need. So, it is not possible for all time to take appropriate decision for the farmers in vegetable production due to their lack of skill, knowledge, etc.

Training exposure on vegetable cultivation:

From stepwise multiple regressions, it was found that training exposure on vegetable cultivation of the respondent had 4^{th} highest contribution to their knowledge on postharvest practices of vegetables. Correlation matrix also showed that training on vegetable cultivation of the respondents had significant positive relationship with their knowledge on post harvest practices of vegetables (Appendix-B and Table 4.17).

Training provides the structures, techniques and awareness to manage time and workload efficiently, which increases productivity and motivates farmer more to achieve more. Training received develops the farmers' knowledge, skill, and attitude in positive manner. The farmer who has no training cannot gain enough knowledge, skill and practical experience. Such consideration indicates the need for improving knowledge and skill level of the farmers by supplying enough training for gaining the knowledge on post harvest practices of vegetables.

Level of Education

Stepwise multiple regressions revealed that level of education of the respondents had lowest contribution to their knowledge on postharvest practices of vegetables. Correlation matrix also showed that level of education of the respondents had significant positive relationship with their knowledge on postharvest practices of vegetables (Appendix-B and Table 4.15).

Education helps the farmers to face the adverse condition and adjust with unfavorable condition through reading leaflets, booklets, books and other printed materials in this case. Education helps the farmers to broaden their outlook and expand mental horizon by helping them to develop proper attitude and correct perception to decrease knowledge gap about production technology of crops. An

educated man is relatively more responsive to the technology, new innovation. S/he can easily contact with various extension agent and make frequent contact with other information sources, which make them able to acquire adequate accurate information. S/he has enough courage to take risk. The farmers who have no schooling, s/he is supposed to face a great difficulty in adjusting with the unfavorable condition regarding knowledge on vegetable production. Such consideration indicates the need for improving literacy level among the farmers for having the knowledge on postharvest practices of vegetables.

4.4 Problem Faced Index in Vegetable Cultivation

The observed problem faced index in vegetables cultivation ranged from 158 to 276 against the possible range of 0 to 327. The formula for determining PFI has been shown in chapter 3. The selected nine problems faced by the respondents which were arranged in rank order according to their descending order of problem faced index (PFI) as shown in Table 4.17.

Table 4.17 Rank order of 9 selected problems faced by the farmers in vegetable cultivation

N=109

Problems	Extent of Problem faced				PFI	Rank Order
	High problem (3)	Medium problem (2)	Little problem (1)	No problem (0)		
Lower price of vegetable	70	30	6	3	276	1
High price of inputs	50	42	10	7	244	2
Disease attack	40	52	14	3	238	3
Insect attack	44	41	19	5	233	4
Lack of technical knowledge	42	38	20	9	222	5
Lack of HYV (High Yielding Variety) seed/seedling	35	42	21	11	210	6
Lack of technical help	39	30	23	17	200	7
Lack of loan facility	40	19	36	14	194	8
Losses of vegetable production due to natural calamity	12	25	43	29	158	9

PFI = Problem Faced Index

N = 109

On the basis of PFI, it was observed that 'Lower market price of vegetables' ranked first followed by 'High price of inputs', 'Disease attack', 'Insect attack', 'Lack of technical knowledge', 'Lack of HYV (High Yielding Variety) seed/seedling', 'Lack of technical help', 'Lack of loan facility', 'Losses of vegetable production due to natural calamity'.

CHAPTER 5

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

This chapter presents summary of findings, conclusions and recommendations of the study.

5.1 Summary of findings

The major findings of the study are summarized below:

5.1.1 Individual characteristics of the farmers

Age: Slightly above half (50.50 percent) of the farmers was middle aged, while 29 percent were young aged and 22 percent were old aged.

Level of Education: The highest proportions (37.6 percent) of the farmers were in the secondary level. Primary, above secondary, can sign only and illiterate level of literacy found 23.9 percent, 0.9 percent, 24.8 percent and 12.8 percent respectively. It means, about cent percent (99.10 percent) of the respondent were illiterate or having education up to secondary level.

Family Size: The highest proportion (58.7 percent) of the farmers had medium family size, while 25.7 percent and 15.6 percent belonged to the small family size and large family size respectively.

Farm size: The highest proportion (70.6 percent) of the farmers had small farm size, while 8.3 percent and 21.1 percent belonged to the medium farm and marginal farm respectively.

Vegetable cultivation area: Overwhelming majority (80.7 percent) of the respondents had small farm area, while 16.5 percent and 2.8 percent belonged to the medium area and large area respectively.

Experience in vegetable production: The highest proportion (40.4 percent) of the farmers had medium farming experience, while 35.8 percent and 23.9 percent belonged to the long farming experience and short faming experience respectively. It means, overwhelming majority (83.50 percent) of the vegetable growers had low to medium training on vegetable cultivation.

Annual family income: The highest proportion (68.80 percent) had medium annual family income compared with 28.4 percent having low income and 2.8 percent having high annual family income.

Annual income from vegetable cultivation: The highest proportion (45 percent) of the vegetable growers had low income compared with 41.3 percent and 13.8 percent having medium and high income from vegetable cultivation respectively.

Commercialization of vegetables: The highest proportion (59.60 percent) had high commercialization compared to 21.10 percent and 19.30 percent having low and medium commercialization of vegetable cultivation respectively.

Training exposure on vegetable cultivation: Most (75.20 percent) of the respondents had low training exposure compared to 16.50 percent and 8.30 percent having no training and medium training respectively. It means, overwhelming majority (83.50 percent) of the vegetable growers had low to medium training on vegetable cultivation.

Adoption of post harvest practices of vegetables: Majority (73.40 percent) of the respondents had medium adoption of post harvest practices, while 22.9 percent and 3.7 percent had high and low adoption of post harvest practices. It means, majority (73.40 percent) of the respondents had medium adoption of post harvest practices of selected vegetables.

Problem faced in vegetable cultivation: The highest proportion (60.60 percent) had medium problem faced compared to 39.40 percent having high adoption of

post harvest practices. Overwhelming majority (60.60percent) of the vegetable growers faced medium problem in vegetable cultivation.

Knowledge on post harvest practices of vegetables

Majority (56 percent) of the respondents had medium knowledge on post harvest practices of vegetables, while 8.3 percent had low knowledge and 35.8 percent had high knowledge.

5.1.2 Contributions of the selected characteristics of the farmers to their knowledge on post harvest practices of vegetables

Out of the twelve independent variables, only five variables namely level of education, experience in vegetable cultivation, training on vegetable cultivation, adoption of post harvest practices and problem faced in vegetable cultivation of the farmers had significant contribution to their knowledge on post harvest practices of vegetables as indicated by step-wise multiple regression analysis. These five contributory factors combinedly explained 19.70 percent of the total contribution.

5.1.3 Comparative Problem Facing of Selected Items of Vegetable Cultivation

In order to compare the problem faced by the farmers in 9 selected items of vegetable production, a Problem Faced Index (PFI) was computed for each item. Farmers faced highest problems in ‘lower price of vegetable’ followed by ‘high price of inputs’ and ‘pest attack’. ‘Losses of vegetable production due to natural calamity’ was the least problem faced by the farmers.

5.2 Conclusion

“A conclusion presents the statements based on major findings of the study and these statements mostly confirm to the objectives of the research in the shortest form. It presents the direct answers of the research objectives, or it relates to the hypothesis” (Labon and Schefter, 1990).

Findings of the present study and the logical interpretation of other relevant facts prompted the researcher to draw the following conclusions:

1. The findings of the study revealed that majority (56 percent) of the respondents had medium knowledge on postharvest practices of vegetables, while 8.3 percent had low knowledge and 35.8 percent had high knowledge. It means more than three-fifths (64.30 percent) of the vegetable growers had low to medium knowledge on postharvest practices of vegetables. Therefore, it may be concluded that there is necessity to increase the knowledge of the farmers on postharvest practices of vegetables.

2. Overwhelming majority (79.50 percent) of the vegetable growers were young and middle aged and correlation revealed that age of the respondent had significant positive relationship with their knowledge on postharvest practices of vegetables. Therefore, it may be concluded that old aged farmers had more knowledge on post harvest practices of vegetables than young and middle aged farmers.

3. Majority (73.40 percent) of the respondents had medium adoption of post harvest practices of vegetables. Stepwise multiple regression revealed that adoption of post harvest practices of the respondent had the highest contribution to their knowledge on post harvest practices of vegetables. Pearson product moment correlation also revealed that adoption of post harvest practices of the respondent had significant positive relationship with their knowledge on postharvest practices of vegetables. Therefore, it may be concluded that individuals having more adoption of post harvest practices of vegetables had more knowledge on post harvest practices of vegetables.

4. Overwhelming majority (60.60percent) of the vegetable growers faced medium problem in vegetable cultivation. Stepwise multiple regression revealed that problem faced in vegetable cultivation of the respondent had the 2nd highest contribution to their knowledge on post harvest practices of vegetables. Pearson product moment correlation also revealed that problem faced in vegetable cultivation of the respondent had significant negative

relationship with their knowledge on postharvest practices of vegetables. Therefore, it may be concluded that individuals having more knowledge faced fewer problem in vegetable cultivation.

5. Majority (58.7 percent) of the vegetable growers had low to medium experience in vegetable cultivation. Stepwise multiple regression revealed that experience on vegetable of the respondents had the 3rd highest contribution to their knowledge on post harvest practices of vegetables. Pearson product moment correlation also revealed that experience in vegetable cultivation of the respondent had significant positive relationship with their knowledge on postharvest practices of vegetables. Therefore, it may be concluded that individuals having more experience in vegetable cultivation had more knowledge on post harvest practices of vegetables.

6. Overwhelming majority (83.50 percent) of the vegetable growers had low to medium training on vegetable cultivation. Stepwise multiple regression revealed that training on vegetable of the respondent had the 4th highest contribution to their knowledge on post harvest practices of vegetables. Pearson product moment correlation also revealed that training on vegetable cultivation of the respondent had significant positive relationship with their knowledge on postharvest practices of vegetables. Therefore, it may be concluded that individuals having more training exposure had more knowledge on post harvest practices of vegetables.

7. About cent percent (99.10 percent) of the respondent were illiterate or having education up to secondary level. Stepwise multiple regression revealed that education of the respondent had the lowest contribution to their knowledge on post harvest practices of vegetables. Pearson product moment correlation also revealed that education of the respondent had significant positive relationship with their knowledge on postharvest practices of vegetables. Therefore, it may be concluded that more educated

vegetable growers had more knowledge on post harvest practices of vegetables.

8. Farmers faced highest problems in ‘lower price of vegetable’ followed by ‘high price of inputs’ and ‘pest attack’. Therefore, it may be concluded that emphasis should be taken to minimize these problems.

5.3 Recommendation

5.3.1 Recommendations for policy implications

On the basis of experience, observation and conclusions drawn from the findings of the study following recommendations are made:

1. Majority (56 percent) of the vegetable growers had medium knowledge on post harvest practices of vegetables and 8.3 percent had low knowledge. Therefore it may be recommended that attempts should be taken by Department of Agricultural Extension (DAE) and other extension providers to arrange training, motivational campaigning and provide post harvest management guide for increasing post harvest knowledge of the vegetable growers.

2. Overwhelming majority (79.50 percent) of the vegetable growers was young and middle aged and age of the respondent had significant positive relationship with their knowledge on postharvest practices of vegetables. Therefore it may be recommended that attempts should be taken by the concerned authorities to increase knowledge on post harvest management practices especially for the young and middle aged vegetable growers.

3. Majority (73.40 percent) of the respondents had medium adoption of post harvest practices of selected vegetables. Adoption of post harvest practices of the respondent had the highest contribution to their knowledge on post harvest practices of vegetables. Again adoption of post harvest practices of the respondent had significant positive relationship with their knowledge on

postharvest practices of vegetables. Therefore, it may be recommended that motivational campaigning to be arranged for the vegetable growers, so that they can adopt modern post harvest technologies of vegetables to minimize the post harvest losses.

4. Overwhelming majority (60.60percent) of the vegetable growers faced medium problem in vegetable cultivation and the rest 39.40 percent of them faced high problem in vegetable cultivation. Problem faced in vegetable cultivation of the respondent had the 2nd highest contribution to their knowledge on post harvest practices of vegetables. Again problem faced in vegetable cultivation of the respondent had significant negative relationship with their knowledge on postharvest practices of vegetables. Therefore, it may be recommended that attempts should be taken to provide technical support to the vegetable growers to minimize their problems in cultivation, harvesting and marketing.

5. Majority (56.70 percent) of the vegetable growers had medium to high experience in vegetable cultivation. Training on vegetable of the respondent had the 3rd highest contribution to their knowledge on post harvest practices of vegetables. Again experience in vegetable cultivation of the respondent had significant positive relationship with their knowledge on postharvest practices of vegetables. Therefore, it may be recommended that necessary technical support to be provided to the low and medium experienced vegetable growers for increasing their knowledge on postharvest management of vegetables.

6. Overwhelming majority (83.50 percent) of the vegetable growers had low to medium training on vegetable cultivation. Training on vegetable of the respondent had the 4th highest contribution to their knowledge on post harvest practices of vegetables. Again training on vegetable cultivation of the respondent had significant positive relationship with their knowledge on

postharvest practices of vegetables. Therefore it may be recommended that attempts should be taken for vegetable growers to arrange necessary training on post harvest practices by providing detail post harvest management guide.

7. About cent percent (99.10 percent) of the respondent were illiterate or having education up to secondary level. Education of the vegetable growers had the highest contribution to their knowledge on post harvest practices of vegetables. Again education of the respondent had significant positive relationship with their knowledge on postharvest practices of vegetables. Therefore it may be recommended that attempts should be taken to establish adult learning centre to increase educational level as well as post harvest management knowledge of the vegetable growers.

8. Farmers faced highest problems in ‘lower price of vegetable’ followed by ‘high price of inputs’ and ‘pest attack’. Therefore, it may be recommended that necessary technical support to be provided for the vegetable growers to minimize their problems with special emphasis to these problems.

5.3.2 Recommendations for further study

A small and limited research work cannot provide unique and universal information related to actual impact of improving socio-economic status of the farmers. Further studies should be undertaken on related matters. On the basis of scope and limitations of the present study and observations made by the researcher, the following recommendations are made for further study:

i. The study was conducted in Alamdanga Upazilla under Chuadanga District. Similar studies should be conducted in other parts of the country to get a clear picture of the whole country which will be helpful for effective policy formulation.

ii. The present study was undertaken to explore relationships of twelve selected characteristics of the farmers with their knowledge on post harvest practices of vegetables. Therefore, it could be recommended that further studies should be designed considering other agricultural and non-agricultural activities and including other characteristics of the farmers that might affect knowledge on post harvest practices of vegetables.

iii. In the present study family size, farm size, vegetable cultivation area, annual income from vegetable, commercialization and annual family income had no significant relationship with their knowledge on post harvest practices of vegetables. In this connection, further verification is necessary.

iv. All problems affect the performance of the farmers. There is need for undertaking research on the various problems faced by the farmers which affect their performance.

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Appendix-A

(English Version of the Interview Schedule)

DEPARTMENT OF AGRICULTURAL EXTENSION AND INFORMATION SYSTEM

SHER-E-BANGLA AGRICULTURAL UNIVERSITY

DHAKA-1207

Interview Schedule for Collection of Data in connection with the study

"FARMERS' KNOWLEDGE ON POST HARVEST PRACTICES OF VEGETABLES"

Serial No.: ☐

Respondent Name :

Village: Union: Upazilla:

District: Mobile No:

[Please provide the following information. Your information will be kept confidential and will be used for research purpose only.]

1. Age

Please mention your

age.....years.

2. Level of Education

Please mention your level of education.

a. I cannot read or write.

b. I can sign only

c. I have studied up to class (…….…….)

3. Family Size

Please mention the number of your family members including yourself. (…….. persons)

4. Farm Size:

Please indicate the area of land under your possession:

Sl No.	Types of land use	Land area	
		Local unit	Hectare
1.	Homestead area		
2.	Own land under own cultivation		
3.	Given to others as borga		
4.	Taken borga from others		
5.	Taken lease from others		
6.	Own pond		
7.	Fallow land		
	Total		

5. Vegetable Cultivation Area

Please mention the total area of land under vegetable production: ……local unit = ……ha.

6. Experience in Vegetable Cultivation

Please state the duration of your direct involvement in vegetable farming. ……years

7. Annual Income from Vegetable

Please mention your annual income from vegetable:

Vegetables' Name	Production (Unit)	Per Unit Price	Total (Tk.)	Amount of sold Vegetable (Unit)	Price of Sold Vegetable (Tk.)
Brinjal					
Cabbage					
Cucumber					
Tomato					
Cauliflower					
Potato					
Radish					
Spinach					
Indian Spinach					
Red Amaranth					
Sweet Gourd					
Bottle Gourd					
Wax Gourd					
Okra					
Carrot					
Others					

8. Commercialization of vegetable

$$\text{Commercialization score} = \frac{\text{Value of sold vegetable}}{\text{Total value of raised vegetable}} \text{x}100$$

9. Annual Family Income

Please indicate the income of your family from different sources in the last year.

Sl. No.	Sources of income	Monthly income(TK)	Yearly income(TK)
1.	Agriculture (Vegetable)		
2.	Agriculture (Other crops except vegetables)		
3.	Livestock		
4.	Fisheries		
5.	Poultry		
6.	Service		
7.	Business		
8.	Others (please specify)		
Total			

10. Training on Vegetable Cultivation

Have you received any training on vegetable cultivation? ( ) Yes ( ) No

If yes, please give the following information:

Sl. No.	Name of the Training	Sponsoring Organization	Duration (Days)
1.			
2.			
3.			
4.			
Total			

11. Adoption of Postharvest Practices

Please Mention the Extent of Adoption of Postharvest Practices

Sl. No.	Postharvest Practice	Extent of Adoption			
		Regularly	Occasionally	Rarely	Not at All
1.	Harvesting of Vegetable according to right harvesting maturity				
2.	Collection of vegetable from the field on time				
3.	Keeping Harvested Vegetable in a Shady Place				
4.	Sorting of Vegetable				
5.	Grading of Vegetable				
6.	Washing of Vegetable				
7.	Ice cooling				
8.	Modern Packaging				
9.	Use of Lining Material				
10.	Safe Transportation				

12. Problem Faced in Vegetable Cultivation

Please mention the extent of problems related to vegetable cultivation.

Sl. No.	Problem	Extent of Problem			
		High	Medium	Little	No
1.	Lack of HYV (High Yielding Variety) seed				
2.	High price of inputs				
3.	Insect attack				
4.	Disease attack				
5.	Lower price of vegetable				
6.	Lack of technical knowledge				
7.	Lack of technical help				
8.	Lack of loan facility				
9.	Decrease of vegetable production due to natural calamity				

13. Knowledge on Postharvest Practices of Vegetables

Please put the tick mark (√) against each statement:

Sl. No.	Statement	Extent of answer		
		Right	Wrong	Don't Know
1.	It is better to harvest vegetable at morning (+)			
2.	It is to harvest cucumber at green stage before yellowing (+)			
3.	It is better to harvest tomato at 5-10% of ripening color (-)			
4.	No need to keep cover leaf for marketing of cabbage (-)			
5.	It better to apply insecticide/pesticide day before harvesting (-)			
6.	Over mature vegetable is not suitable for eating (+)			
7.	No damage is done if immature or over mature vegetable harvested (-)			
8.	Harvested vegetable should keep in shade for cooling(+)			
9.	Quality detoriate if harvested vegetable keep in sun or in rain (+)			
10.	Sorting is necessary for getting high market price (+)			
11.	Grading is necessary for getting high market price (+)			
12.	No need to wash for marketing of vegetable (-)			
13.	It is better to pack tomato for marketing (+)			
14.	No need of packaging brinjal for marketing (-)			
15.	It is better to pack cumber for marketing purpose(+)			
16.	No need to pack for marketing of cabbage (-)			
17.	Loss can be minimize by using lining material in tomato packaging (+)			
18.	No need to use lining material for marketing of brinjal (-)			
19.	Loss can be minimize by using lining material in cucumber packaging (+)			
20.	No need to use lining material in cabbage packaging (-)			
21.	Transportation loss of Tomato is less in plastic crate and perforated polythene than gunny bag (+)			
22.	Transportation loss of brinjal is not so high in plastic crate and perforated polythene than gunny bag (-)			
23.	Loss is occurred due to transportation of cabbage in sack (-)			
24.	It is better to transport brinjal by using lining material in bamboo basket (+)			
25.	Cucumber should be marketed as soon as possible still it is bright (+)			
26.	It is better to transport two or more vegetables together to minimize transportation cost (-)			
Total				

Thank you very much for your kind cooperation

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Signature of the interviewer and date